How to handle a difficult gallbladder?

Dr Lancelot MARIQUE

Liver and Pancreas Unit

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Cliniques Universitaires Saint-Luc

EPIDEMIOLOGY

GALLSTONE DISEASE = major health problem

1 to 4% of the Western world population every year

10% to 15% during their lifetime

3F : 1M ratio

CHOLECYSTECTOMY :

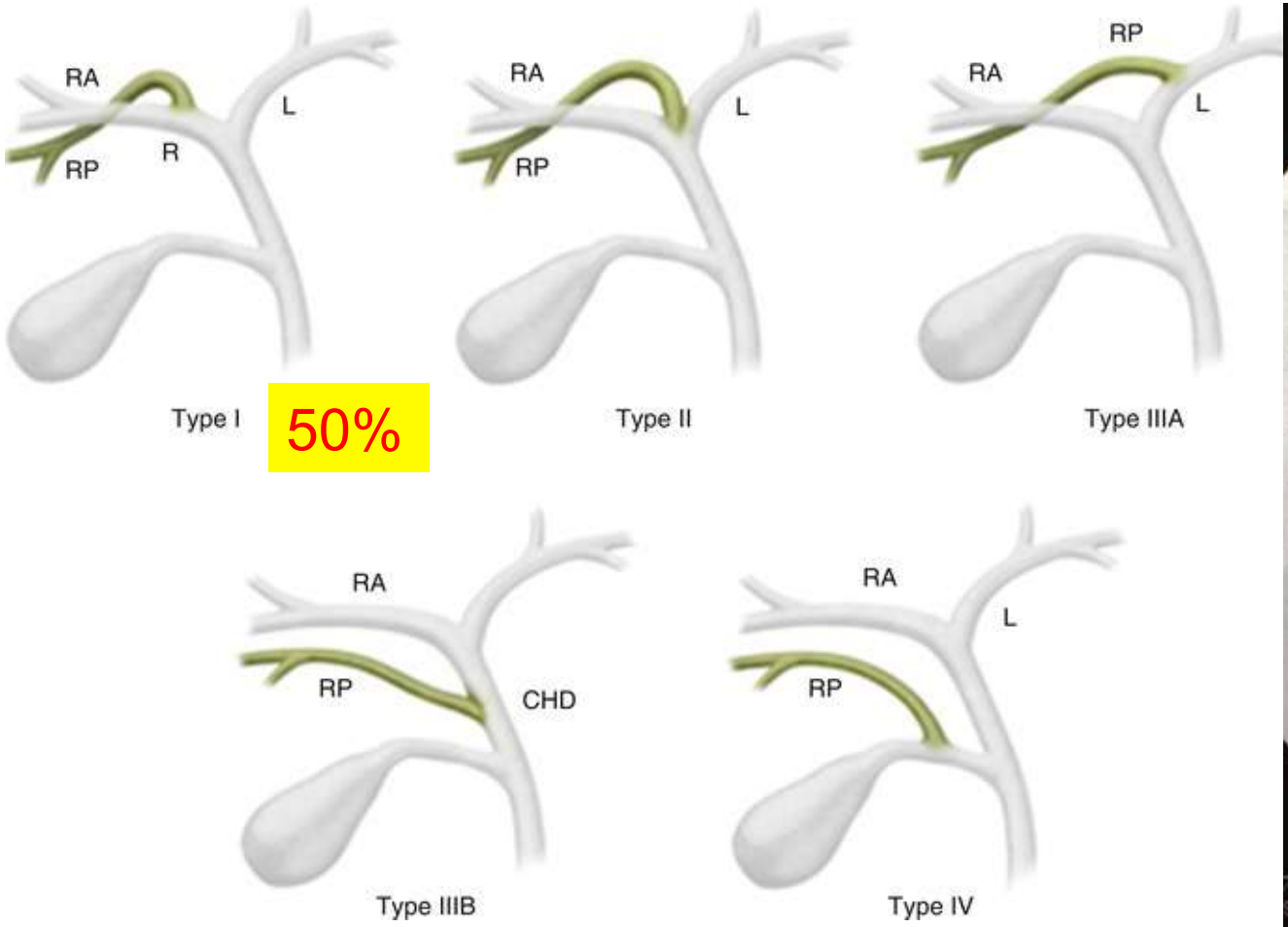
Mean : **24.000 / year** (RIZIV /INAMI)

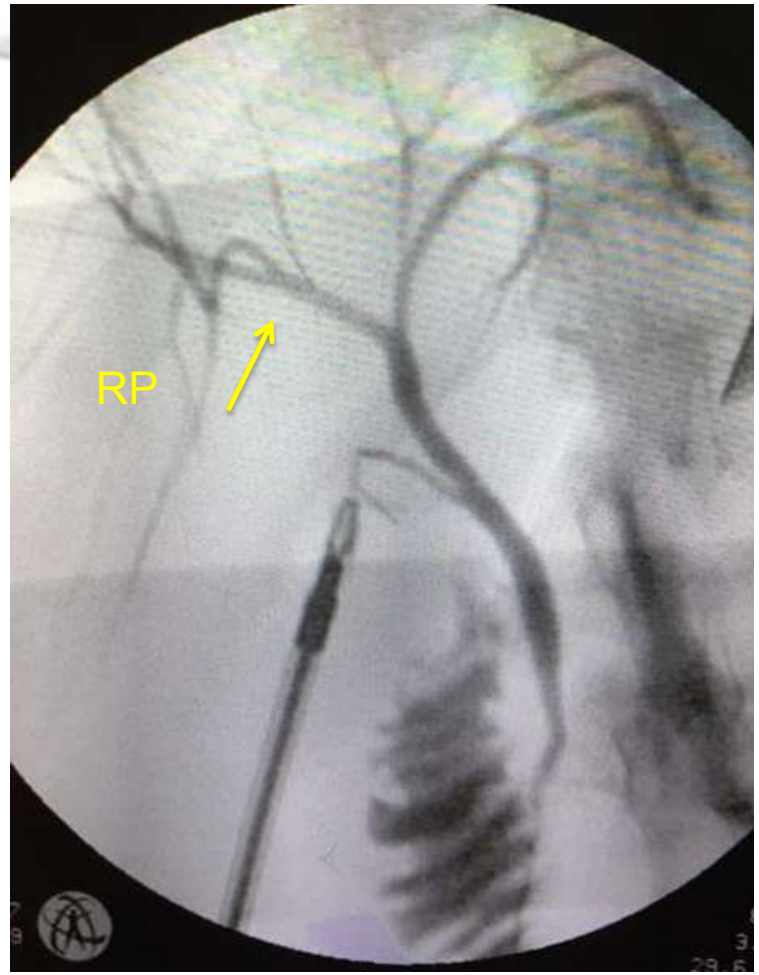
=> Every (young) surgeon will have to deal with (difficult) cases

Sanders BMJ, 2007
Shaffer EA.. Best Pract Res Clin, Gastroenterol. 2006

ANATOMY

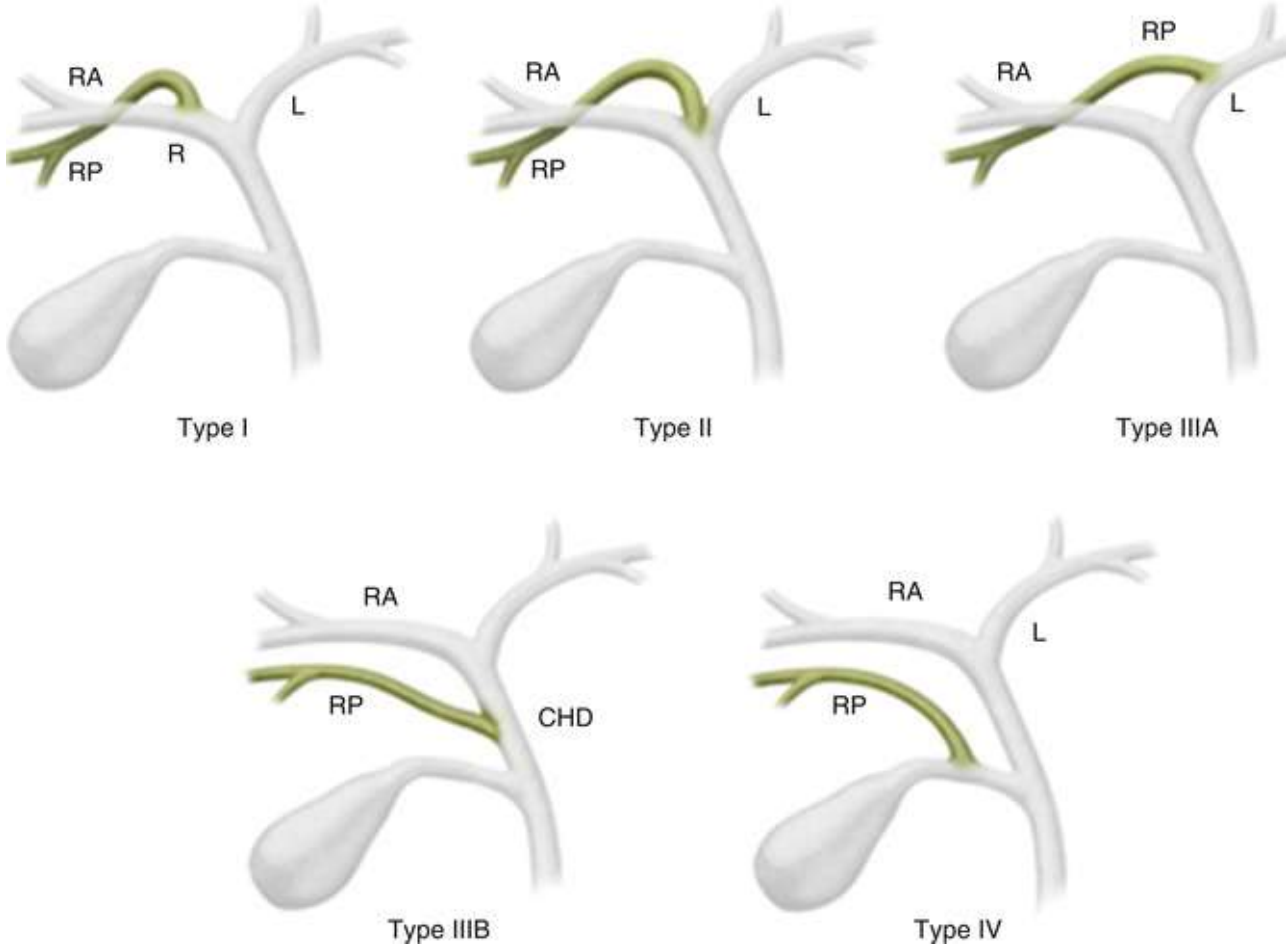
BILIARY VARIATIONS : TYPE I

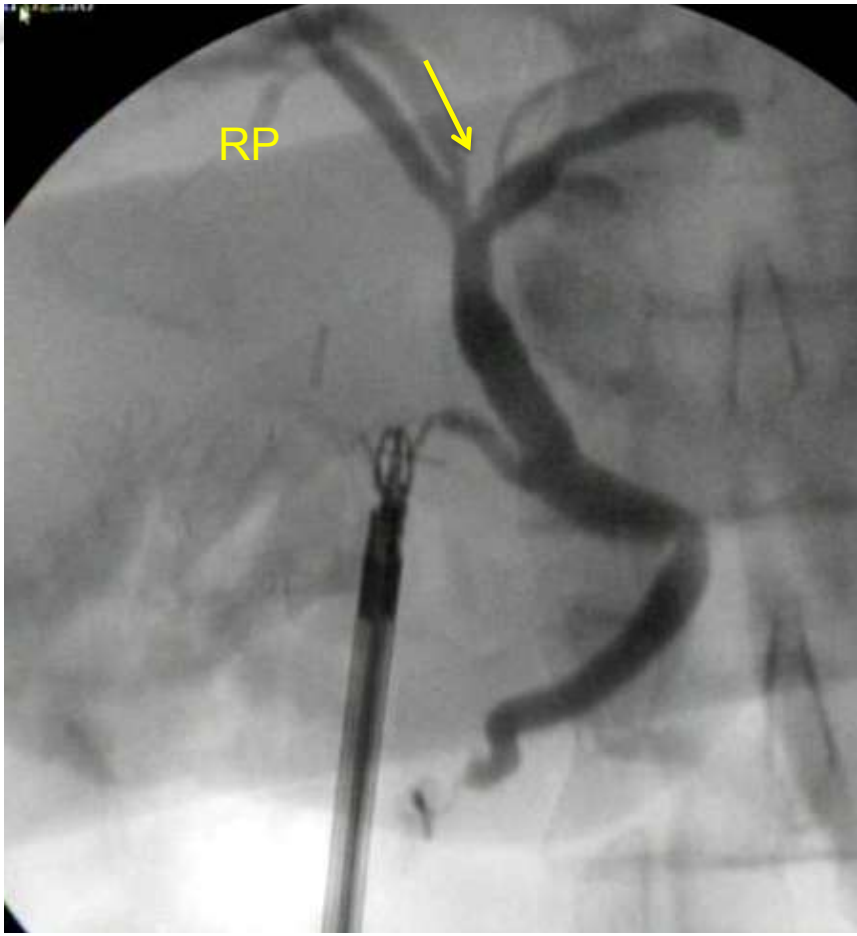




ANATOMY

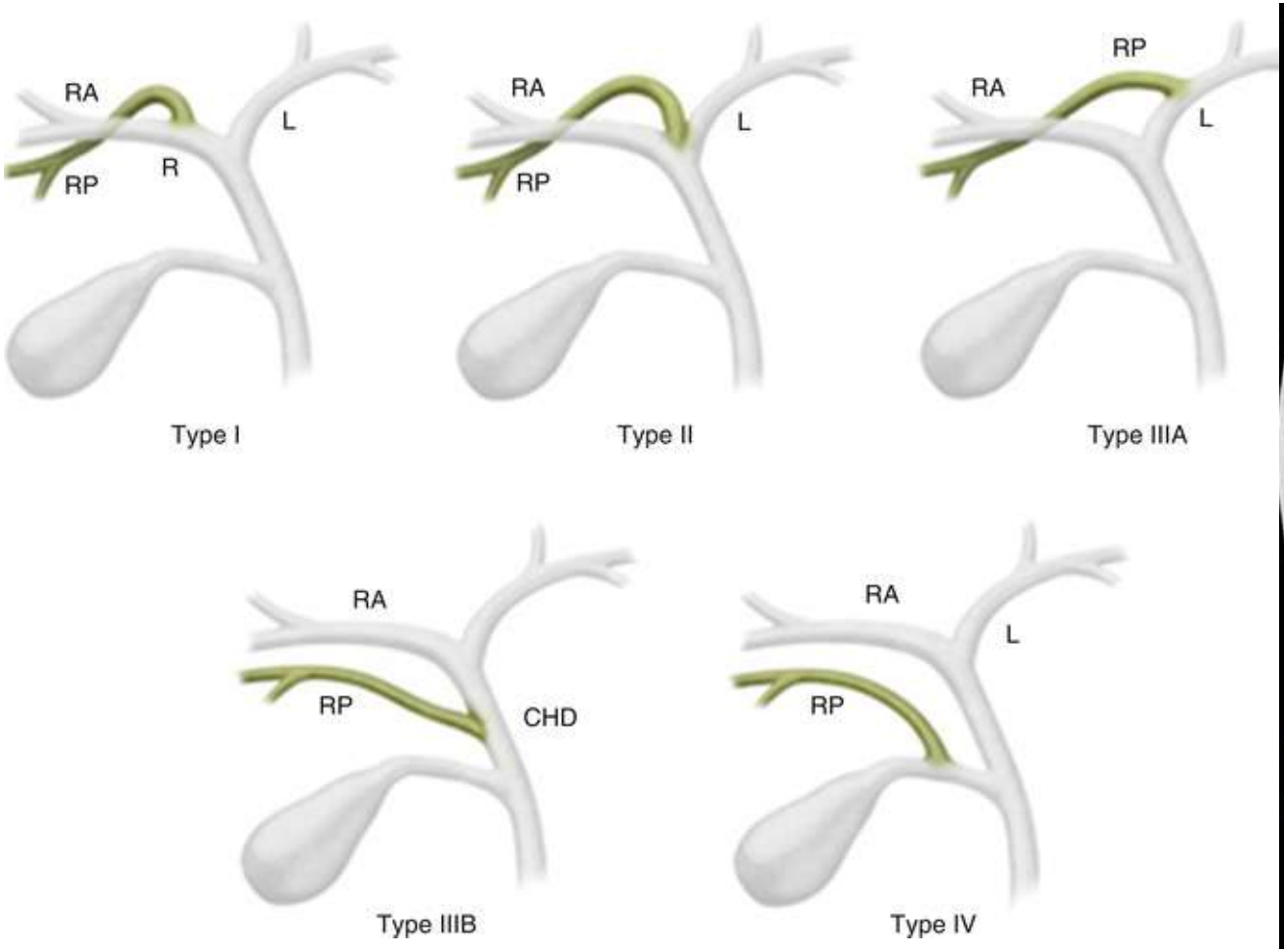
BILIARY VARIATIONS : TYPE II

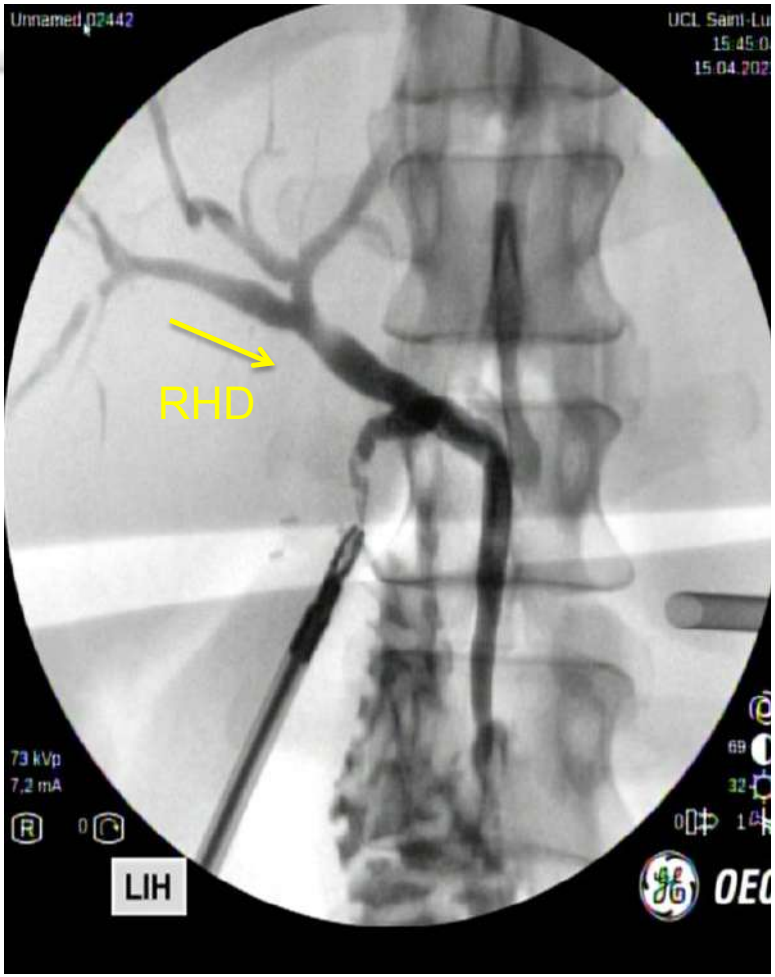




ANATOMY

BILIARY VARIATIONS : TYPE IIIB





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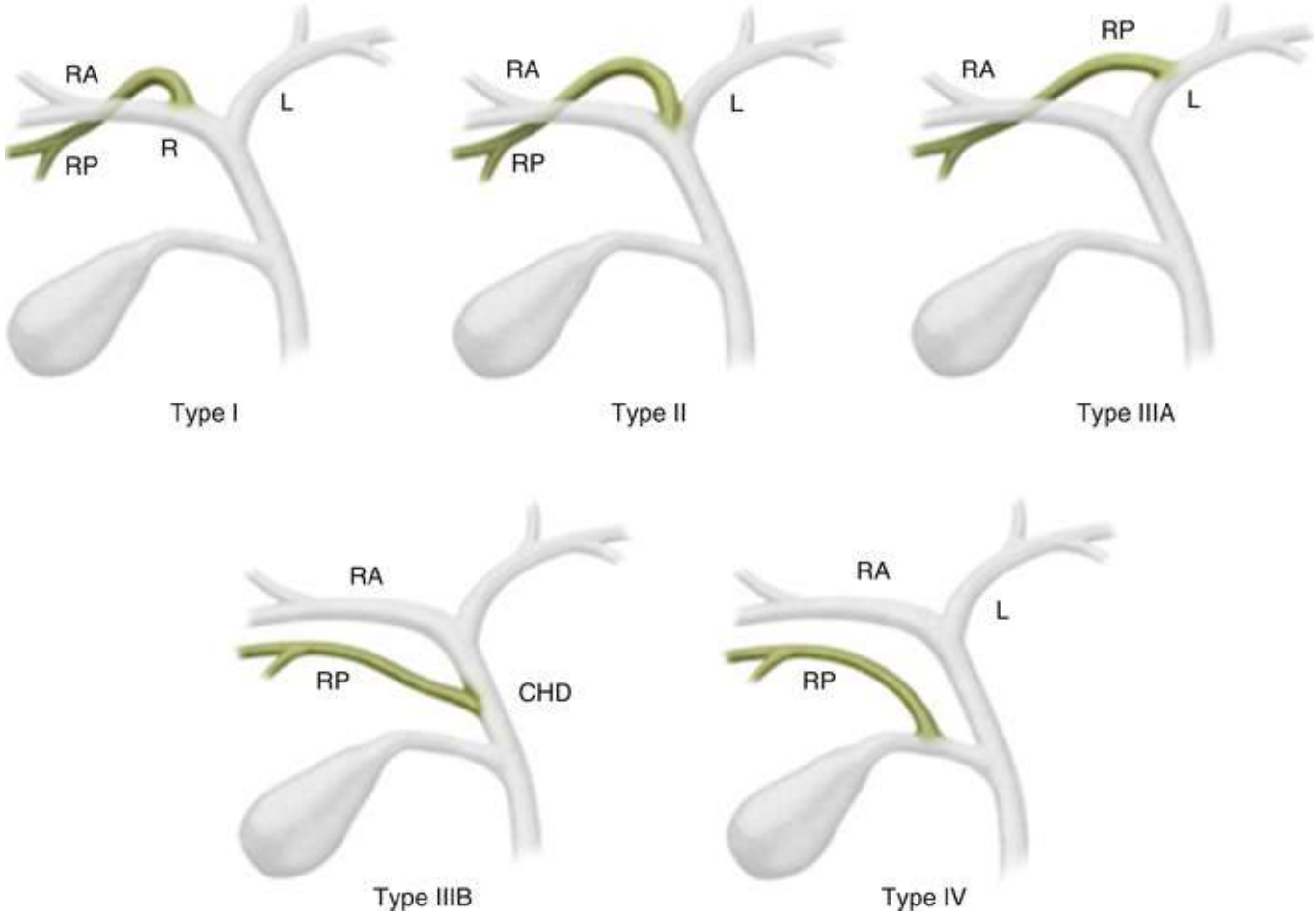
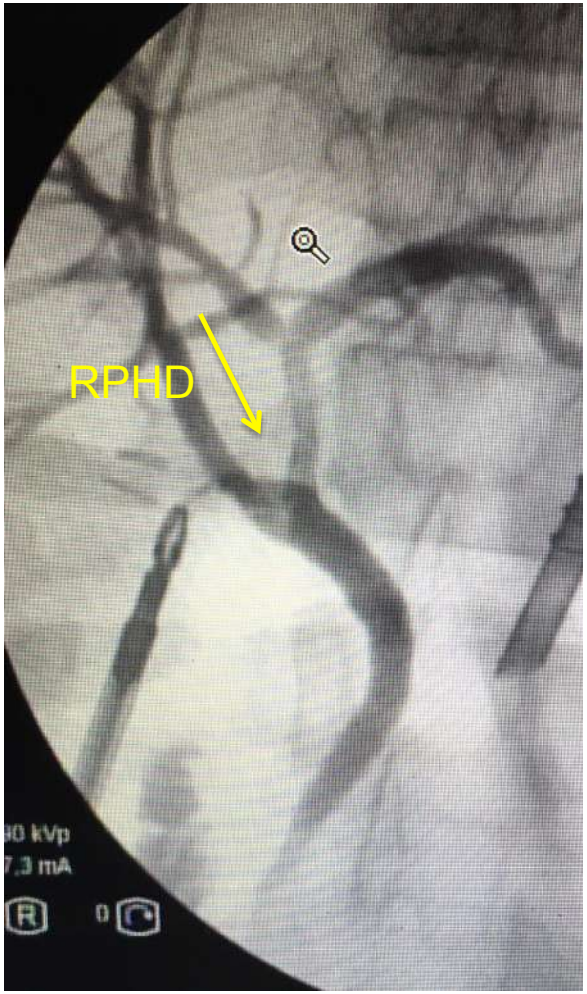
BILIARY VARIATIONS : TYPE IIIB





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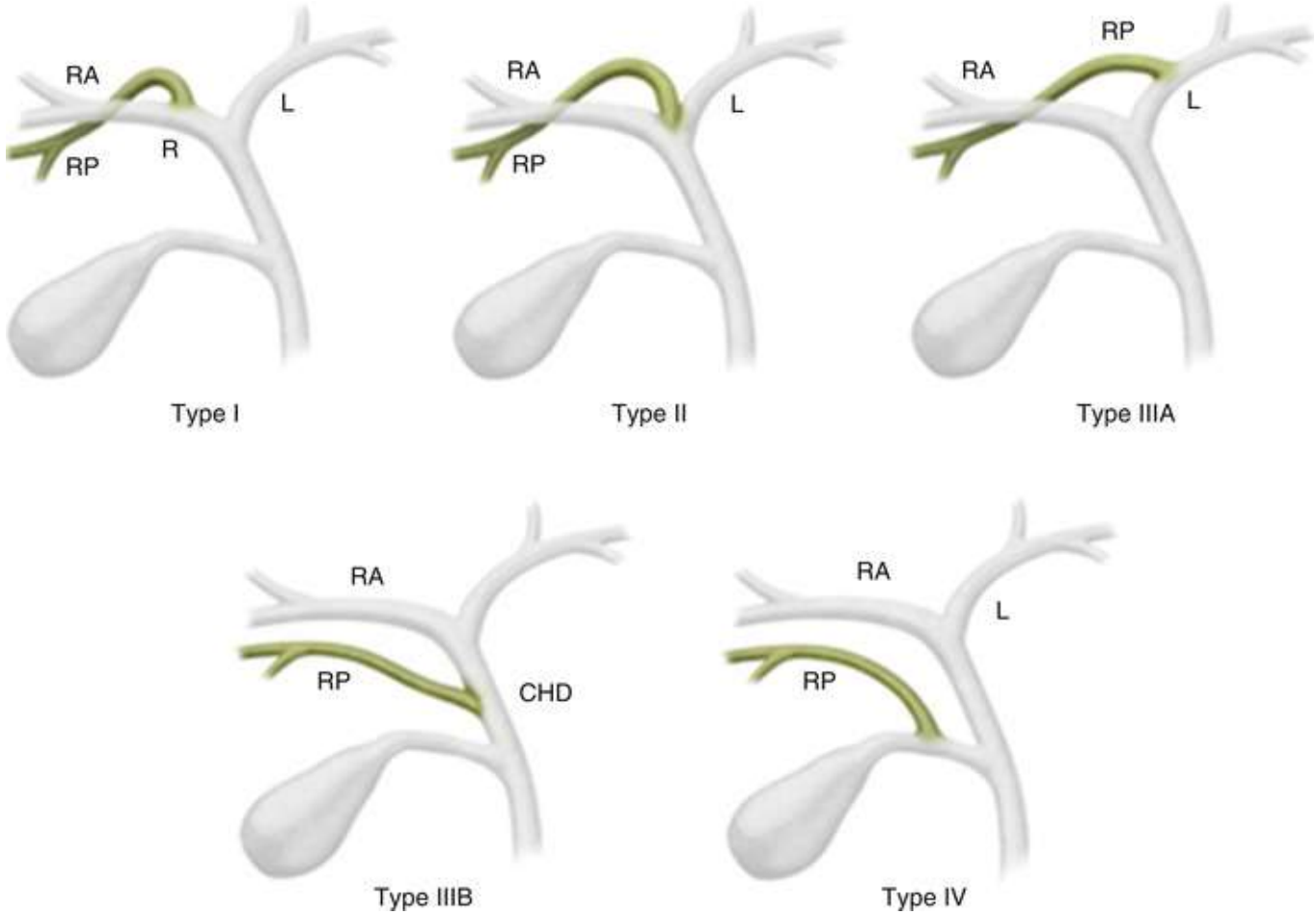

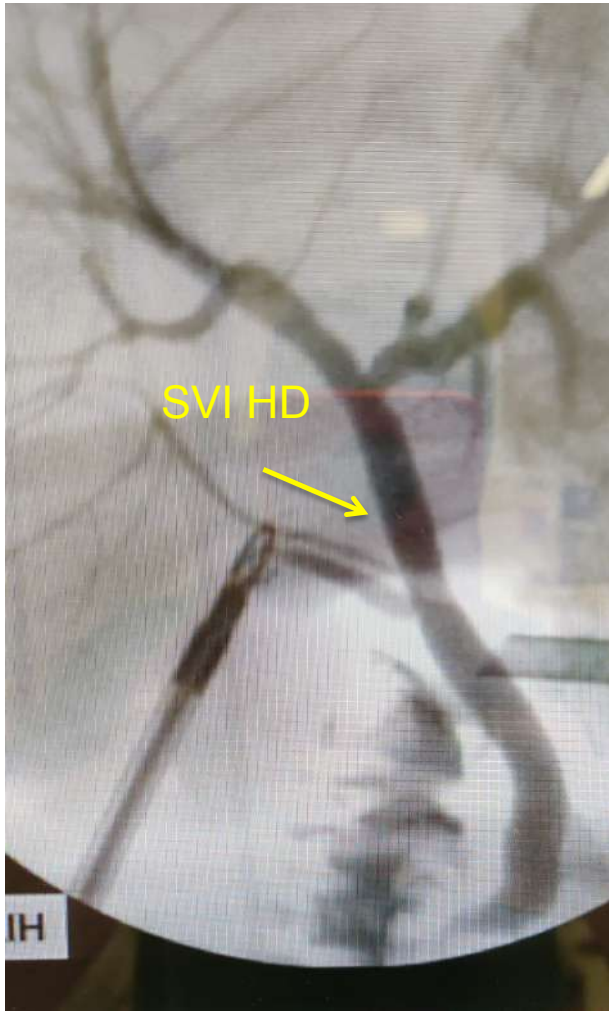

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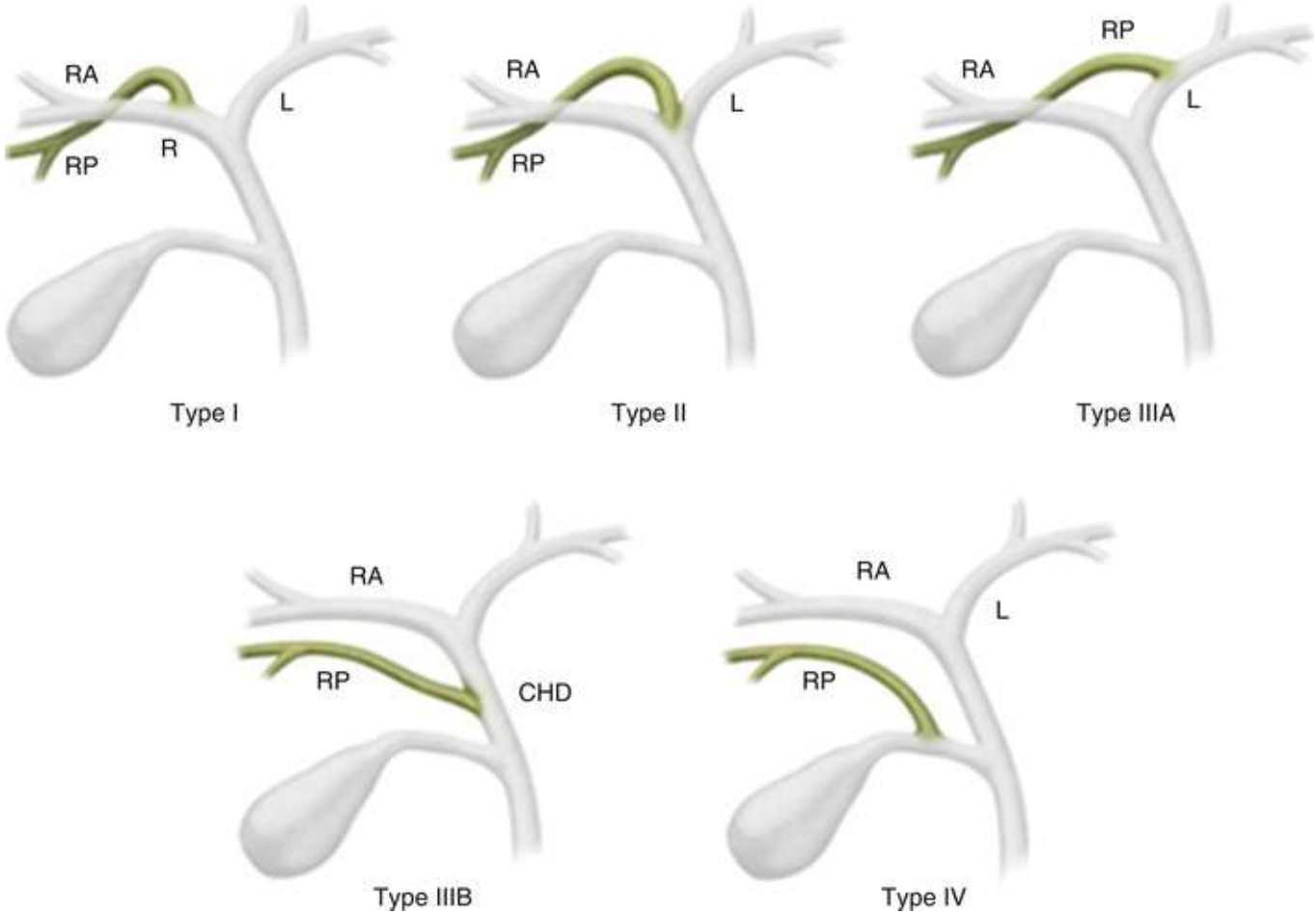
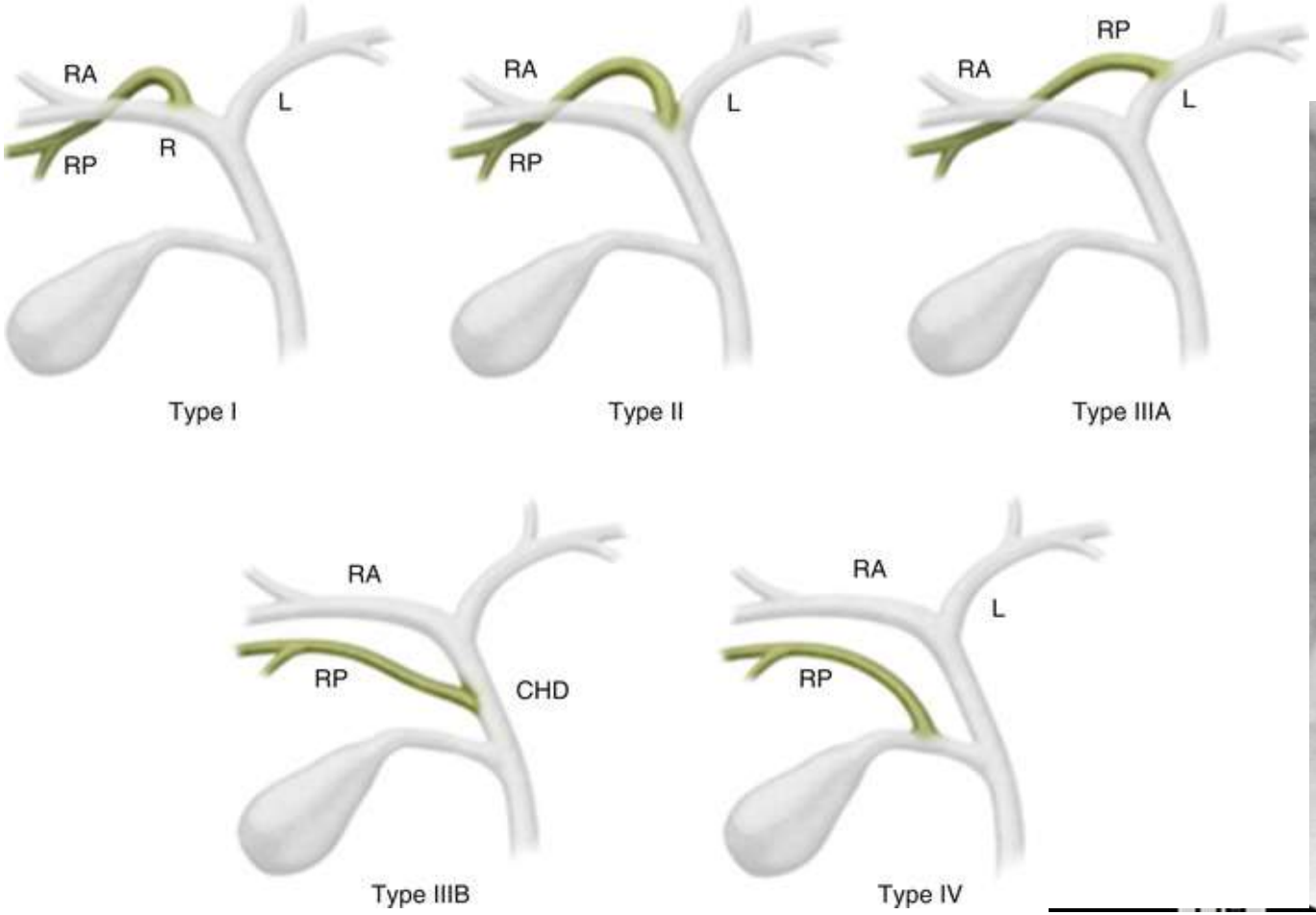
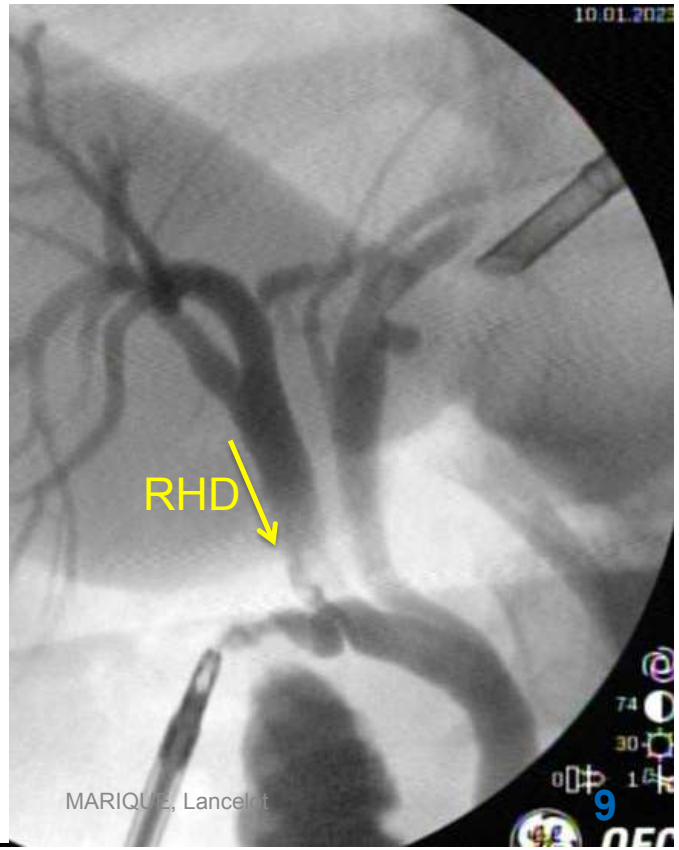


ANATOMY

BILIARY VARIATIONS : TYPE IV





LAPAROSCOPIC CHOLECYSTECTOMY

Cliniques universitaires SAINT-LUC UCLouvain BRUXELLES

= GOLD STANDARD

1993 NIH CONSENSUS CONFERENCE

- Decrease in postoperative pain
- Reduced LOS
- Faster return to work
- Similar morbi-mortality
- Similar Costs

INCREASED RISK OF BILIAIRY DUCT INJURY

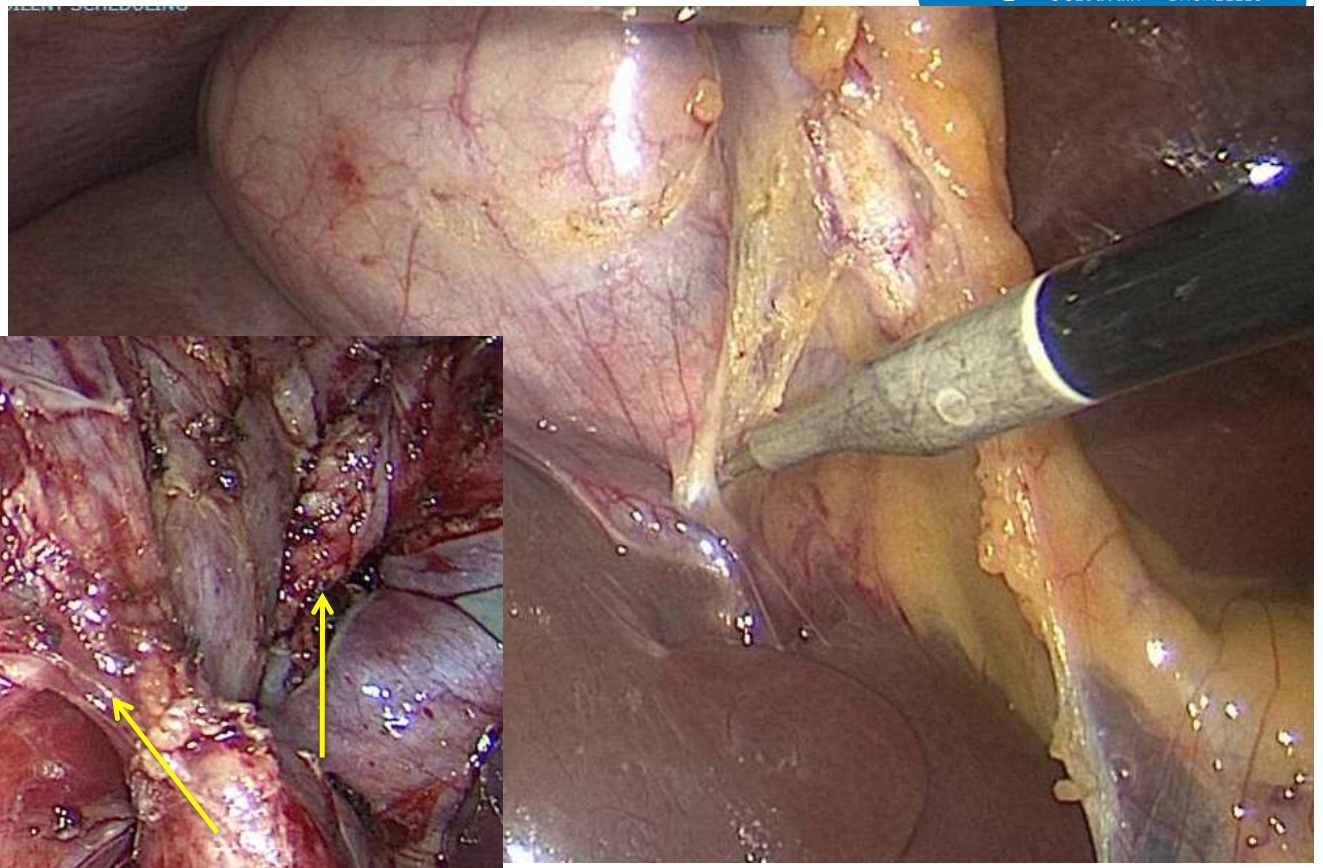
Gallstones and Laparoscopic Cholecystectomy

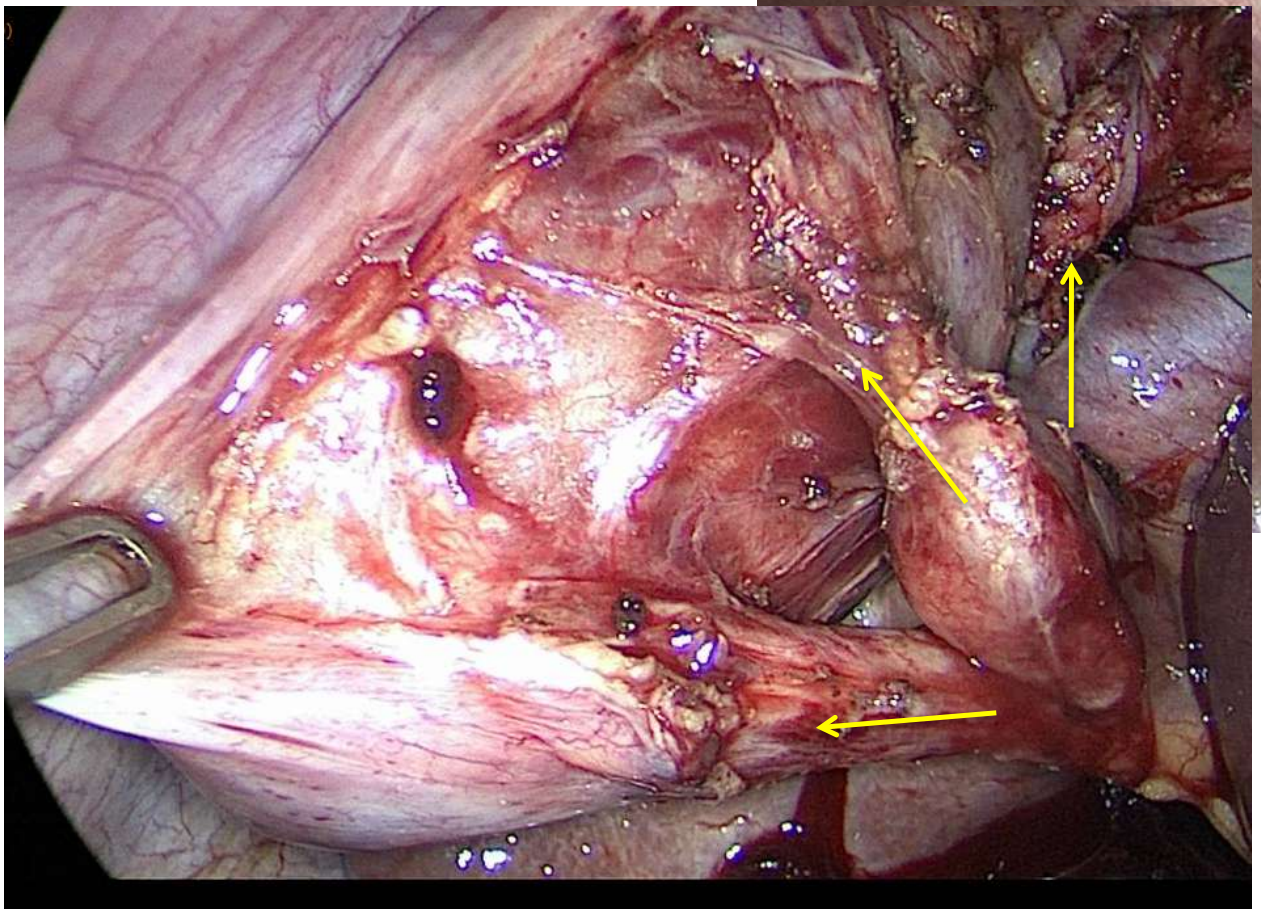
NIH Consensus Development Panel on Gallstones and Laparoscopic Cholecystectomy

SAFE OPERATIVE MANAGEMENT

Cliniques universitaires SAINT-LUC UCLouvain BRUXELLES

30° VIEW LAPAROSCOPE
KEEP LEFT
CRITICAL VIEW OF SAFETY





Strasberg, ***Rationale and use of the critical view of safety in laparoscopic cholecystectomy****. J Am Coll Surg 2010.*

Strasberg, ***An analysis of the problem of biliary injury during laparoscopic cholecystectomy****. J Am Coll Surg , 1995*

DIFFICULT CONDITIONS

Procedure with an increased surgical risk compared with standard cholecystectomy

- Incidence of 16% in large series
- **Severe inflammation, local anatomy distortion and difficult dissections**

Local Conditions

	Gall-bladder	Cystic pedicle	Adhesions
Grade I	Floppy, non-adherent	Clear, thin	Simple, to neck and Hartman's pouch
Grade II	Mucocele Packed with stones	Fat-laden	Simple, up to the body
Grade III	Deep fossa Acute cholecystitis Contracted, fibrous Hartman's pouch adherent to CBD or with stone Mass	Abnormal anatomy Cystic duct short, dilated or obscured	Dense, up to the fundus Involving hepatic flexure or duodenum Duodenum or hepatic flexure difficult to separate

Patient's Conditions

Previous surgery.ies

Obesity

Risk of bleeding

Cirrhosis
Anticoagulation

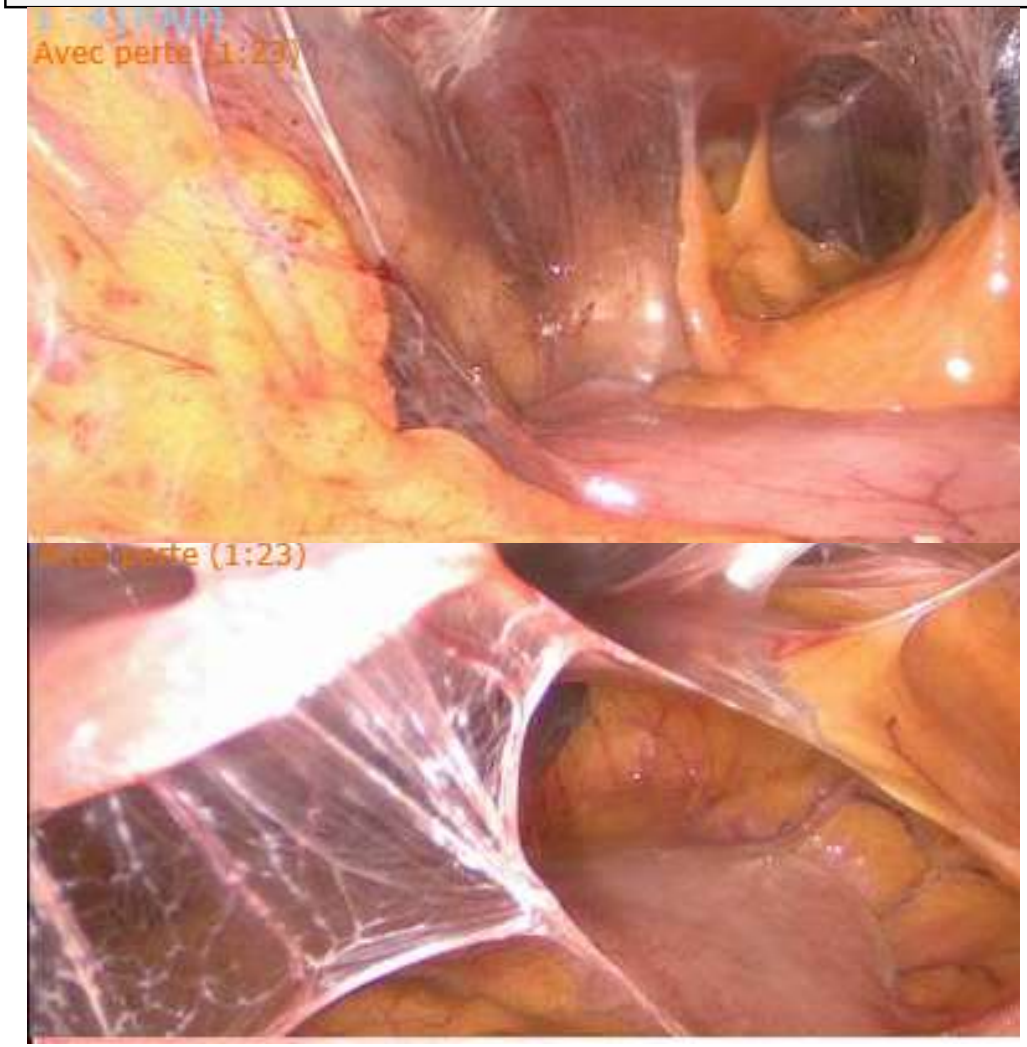
Left-sided gallbladder

EVERY SITUATION in which CVS can not be SAFELY achieved

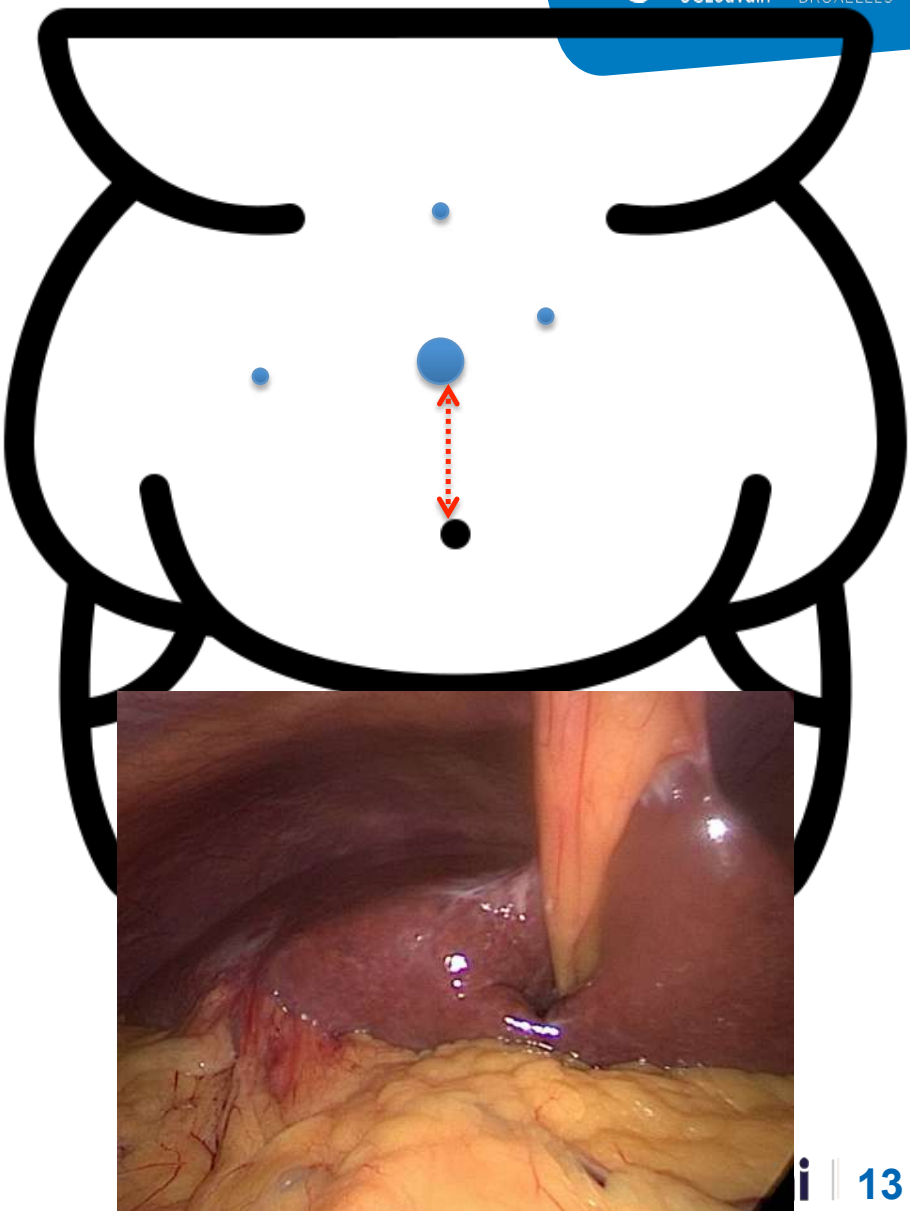
*Nassar, **Minim Invasive Ther Allied Technol,** 1995*

Shaffer EA.. Best Pract Res Clin, Gastroenterol. 2006

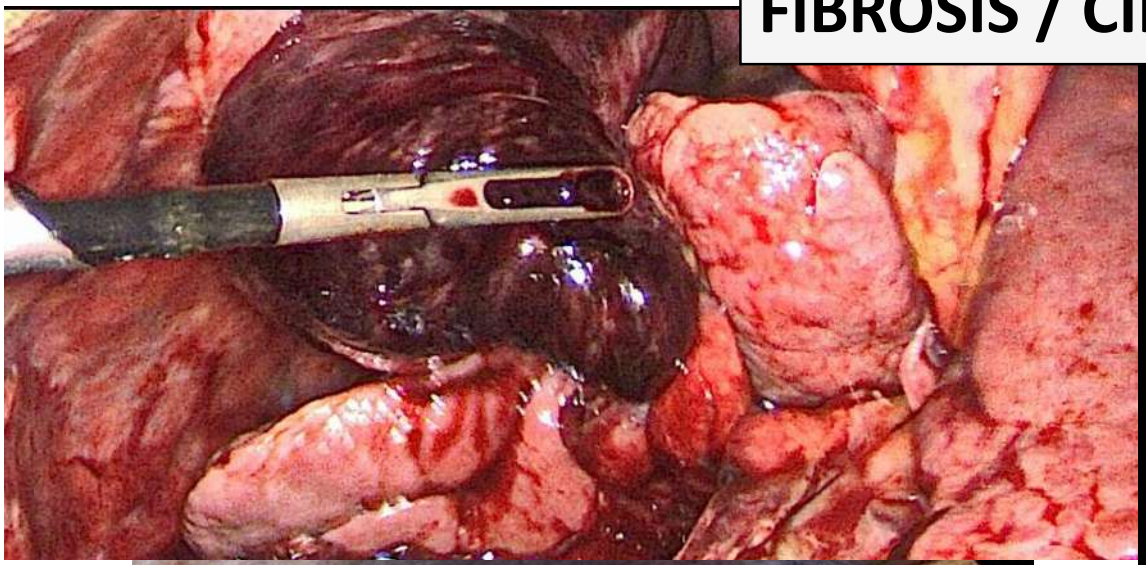
PREVIOUS UPPER ABDOMINAL SURGERIES

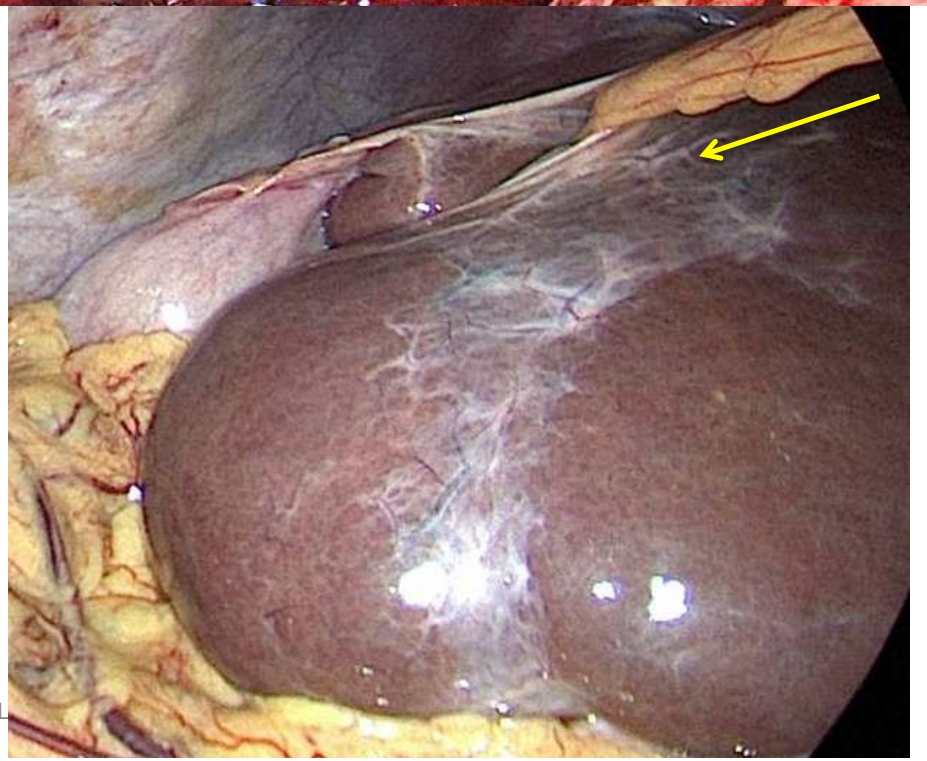


OBESITY

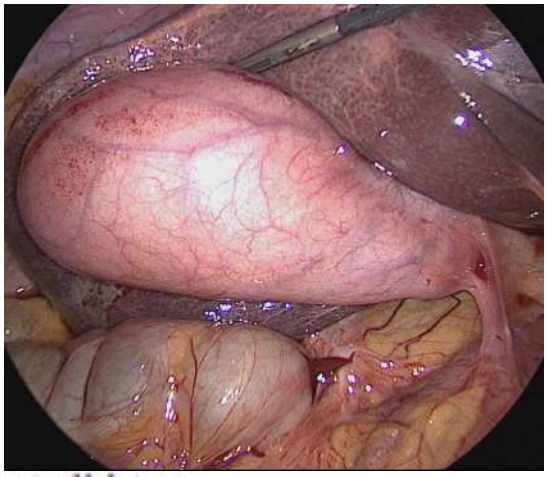


FIBROSIS / CIRRHOSIS





INFLAMMATION



ACUTE CHOLECYSTITIS

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 p
cholecystitis)

Tokyo Guidelines 2018: diagnostic criteria and severity grading of acute cholecystitis (with videos)

Masamichi Yokoe · Jiro Hata · Tadahiro Takada · Steven M. Strasberg · Horacio J. Asbun · Go Wakabayashi · Kazuto Kozaka · Itaru Endo · Daniel J. Deziel · Fumihiko Miura · Kohji Okamoto · Tsann-Long Hwang · Wayne Shih-Wei Huang · Chen-Guo Ker · Miin-Fu Chen · Ho-Seong Han · Yoo-Seok Yoon · In-Seok Choi · Dong-Sup Yoon · Yoshinori Noguchi · Satoru Shikata · Tomohiko Ukai · Ryota Higuchi · Toshifumi Gabata · Yasuhisa Mori · Yukio Iwashita · Taizo Hibi · Palepu Jagannath · Eduard Jonas · Kui-Hin Liau · Christos Dervenis · Dirk J. Gouma · Daniel Cherqui · Giulio Belli · O. James Garden · Mariano Eduardo Giménez · Eduardo de Santibañes · Kenji Suzuki · Akiko Umezawa · Avinash Nivritti Supe · Henry A. Pitt · Harjit Singh · Angus C. W. Chan · Wan Yee Lau · Anthony Yuen Bun Teoh · Goro Honda · Atsushi Sugioka · Koji Asai · Harumi Gomi · Takao Itoi · Seiki Kiriyama · Masahiro Yoshida · Toshihiko Mayumi · Naoki Matsumura · Hiromi Tokumura ·

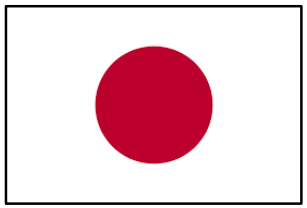
INFLAMMATION

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



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INFLAMMATION

ACUTE CHOLECYSTITIS : OPTIMAL TIMING?

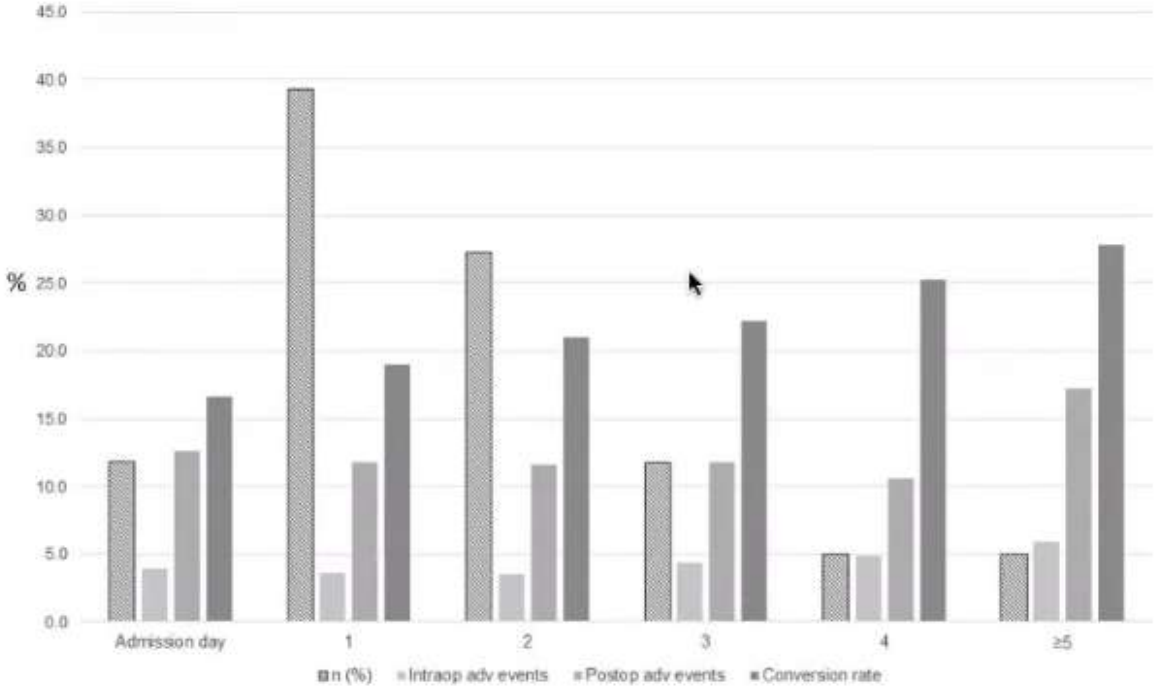
J Gastrointest Surg (2017) 21:33–40
DOI 10.1007/s11605-016-3223-y

2016 SSAT PLENARY PRESENTATION

The Sooner, the Better? The Importance of Optimal Timing of Cholecystectomy in Acute Cholecystitis: Data from the National Swedish Registry for Gallstone Surgery, GallRiks

My Blohm[1,2] · Johanna Österberg[2] · Gabriel Sandblom[1,3] · Lars Lundell[3] · Mats Hedberg[2] · Lars Enochsson[1,3]

J Gastrointestinal Surg 2017



SOMETIMES : it's not a piece of cake …

ORIGINAL ARTICLE

A preoperative predictive scoring system to predict the ability to achieve the critical view of safety during laparoscopic cholecystectomy for acute cholecystitis

Table 2 Results of the univariate and multivariate analyses of risk factors for failure to create the CVS

Variable	Univariate analysis			Multivariate analysis		
	Odds ratio	95% CI	*P value*	Odds ratio	95% CI	*P value*
Alb ≤4.1 g/dl	4.37	1.66–11.49	0.002			
CRP >5.5 mg/dl	14.71	4.51–47.62	<0.001	9.60	12.54–36.27	0.001
Minor axis >4.7 cm	2.55	1.00–6.49	0.046			
Gallstone impaction	2.71	0.98–7.50	0.049	3.80	1.01–14.24	0.048
Time from symptom onset to operation >72 h	19.23	6.25–58.8	<0.001	11.69	3.10–43.57	<0.001

*Onoe, **HBP**, 2017*

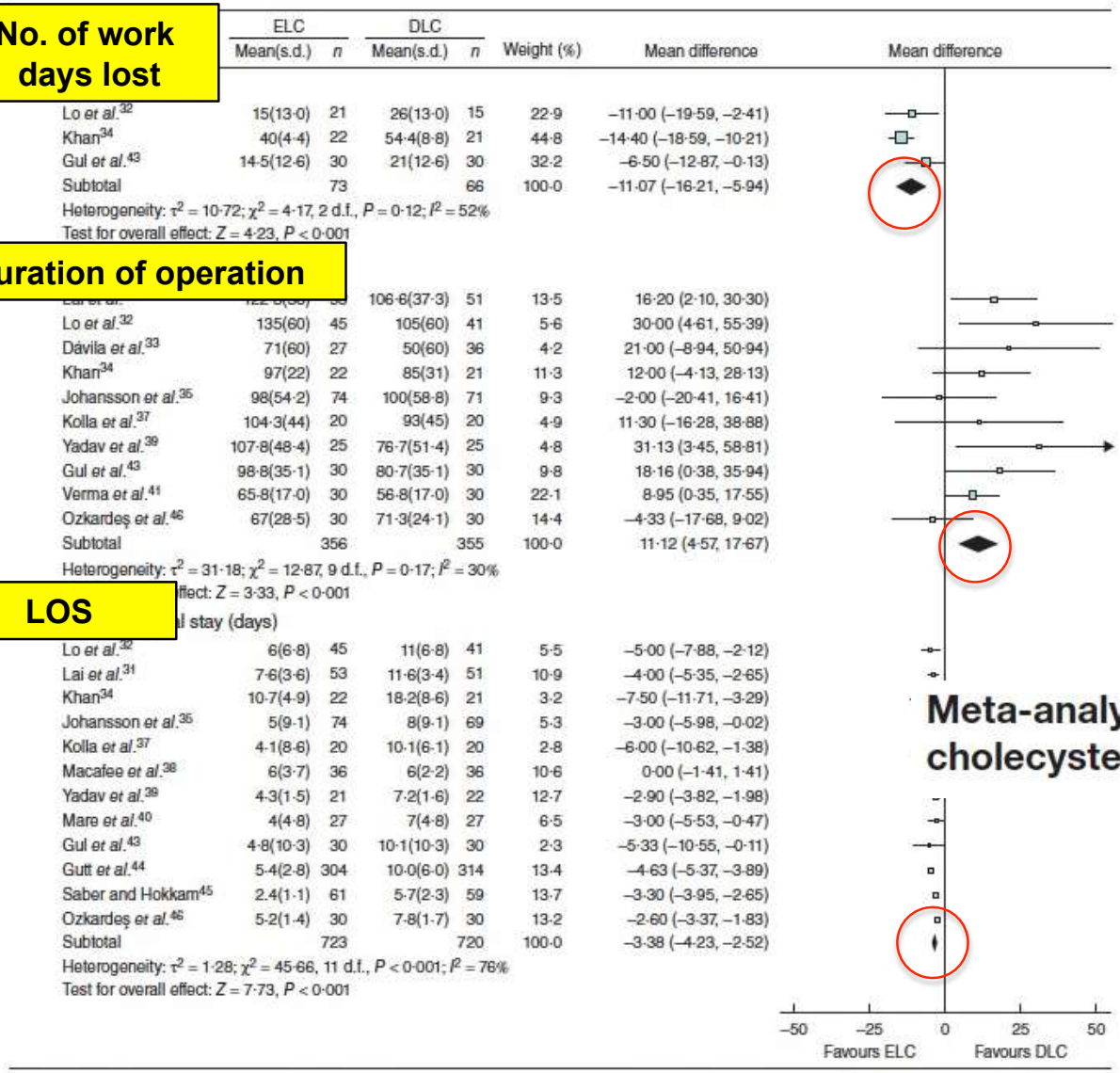
INFLAMMATION

ACUTE CHOLECYSTITIS: ELC or DLC?

No. of work days lost

Duration of operation

LOS



	ELC Mean(s.d.)	n	DLC Mean(s.d.)	n	Weight (%)	Mean difference
Lo *et al.*[32]	15(13·0)	21	26(13·0)	15	22·9	−11·00 (−19·59, −2·41)
Khan[34]	40(4·4)	22	54·4(8·8)	21	44·8	−14·40 (−18·59, −10·21)
Gul *et al.*[43]	14·5(12·6)	30	21(12·6)	30	32·2	−6·50 (−12·87, −0·13)
Subtotal		73		66	100·0	−11·07 (−16·21, −5·94)
Heterogeneity: $\tau^2 = 10·72$; $\chi^2 = 4·17$, 2 d.f., $P = 0·12$; $I^2 = 52\%$						
Test for overall effect: $Z = 4·23$, $P < 0·001$						
			106·6(37·3)	51	13·5	16·20 (2·10, 30·30)
Lo *et al.*[32]	135(60)	45	105(60)	41	5·6	30·00 (4·61, 55·39)
Dávila *et al.*[33]	71(60)	27	50(60)	36	4·2	21·00 (−8·94, 50·94)
Khan[34]	97(22)	22	85(31)	21	11·3	12·00 (−4·13, 28·13)
Johansson *et al.*[35]	98(54·2)	74	100(58·8)	71	9·3	−2·00 (−20·41, 16·41)
Kolla *et al.*[37]	104·3(44)	20	93(45)	20	4·9	11·30 (−16·28, 38·88)
Yadav *et al.*[39]	107·8(48·4)	25	76·7(51·4)	25	4·8	31·13 (3·45, 58·81)
Gul *et al.*[43]	98·8(35·1)	30	80·7(35·1)	30	9·8	18·16 (0·38, 35·94)
Verma *et al.*[41]	65·8(17·0)	30	56·8(17·0)	30	22·1	8·95 (0·35, 17·55)
Ozkardeş *et al.*[46]	67(28·5)	30	71·3(24·1)	30	14·4	−4·33 (−17·68, 9·02)
Subtotal		356		355	100·0	11·12 (4·57, 17·67)
Heterogeneity: $\tau^2 = 31·18$; $\chi^2 = 12·87$, 9 d.f., $P = 0·17$; $I^2 = 30\%$						
ffect: $Z = 3·33$, $P < 0·001$						
l stay (days)						
Lo *et al.*[32]	6(6·8)	45	11(6·8)	41	5·5	−5·00 (−7·88, −2·12)
Lai *et al.*[31]	7·6(3·6)	53	11·6(3·4)	51	10·9	−4·00 (−5·35, −2·65)
Khan[34]	10·7(4·9)	22	18·2(8·6)	21	3·2	−7·50 (−11·71, −3·29)
Johansson *et al.*[35]	5(9·1)	74	8(9·1)	69	5·3	−3·00 (−5·98, −0·02)
Kolla *et al.*[37]	4·1(8·6)	20	10·1(6·1)	20	2·8	−6·00 (−10·62, −1·38)
Macafee *et al.*[38]	6(3·7)	36	6(2·2)	36	10·6	0·00 (−1·41, 1·41)
Yadav *et al.*[39]	4·3(1·5)	21	7·2(1·6)	22	12·7	−2·90 (−3·82, −1·98)
Mare *et al.*[40]	4(4·8)	27	7(4·8)	27	6·5	−3·00 (−5·53, −0·47)
Gul *et al.*[43]	4·8(10·3)	30	10·1(10·3)	30	2·3	−5·33 (−10·55, −0·11)
Gutt *et al.*[44]	5·4(2·8)	304	10·0(6·0)	314	13·4	−4·63 (−5·37, −3·89)
Saber and Hokkam[45]	2·4(1·1)	61	5·7(2·3)	59	13·7	−3·30 (−3·95, −2·65)
Ozkardeş *et al.*[46]	5·2(1·4)	30	7·8(1·7)	30	13·2	−2·60 (−3·37, −1·83)
Subtotal		723		720	100·0	−3·38 (−4·23, −2·52)
Heterogeneity: $\tau^2 = 1·28$; $\chi^2 = 45·66$, 11 d.f., $P < 0·001$; $I^2 = 76\%$						
Test for overall effect: $Z = 7·73$, $P < 0·001$						

Meta-analysis comparing early *versus* delayed lap cholecystectomy for acute cholecystitis

Wu X-D, ***British Journal of Surgery****, 2015*

INFLAMMATION

ACUTE CHOLECYSTITIS: ELC or DLC?

Wound infection

Bile duct Injury

Bile leakage

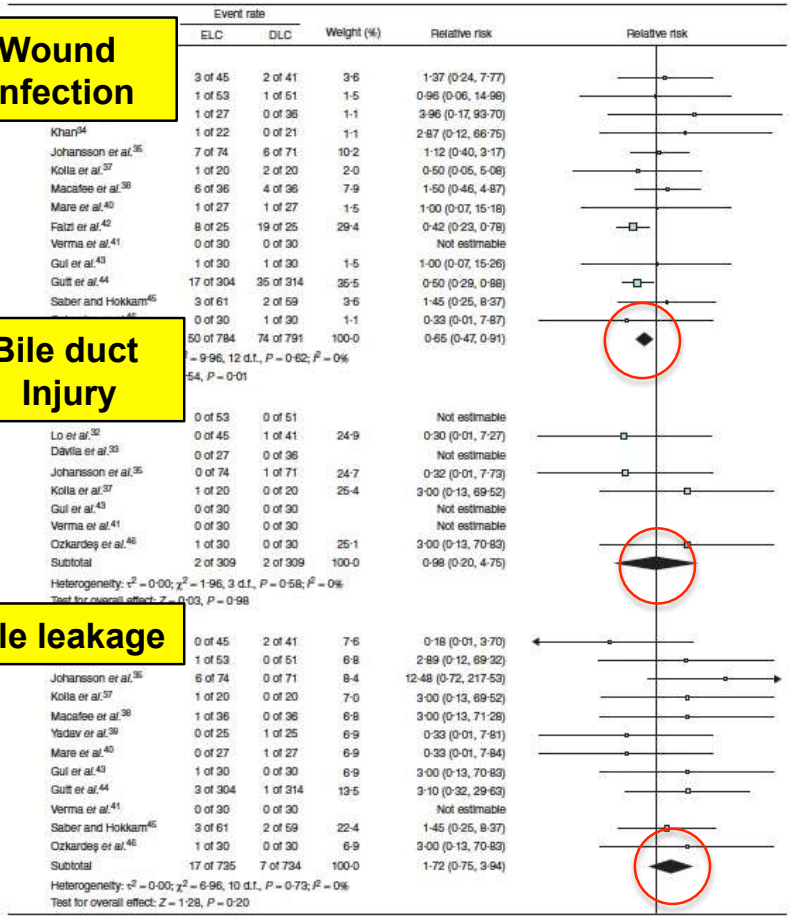


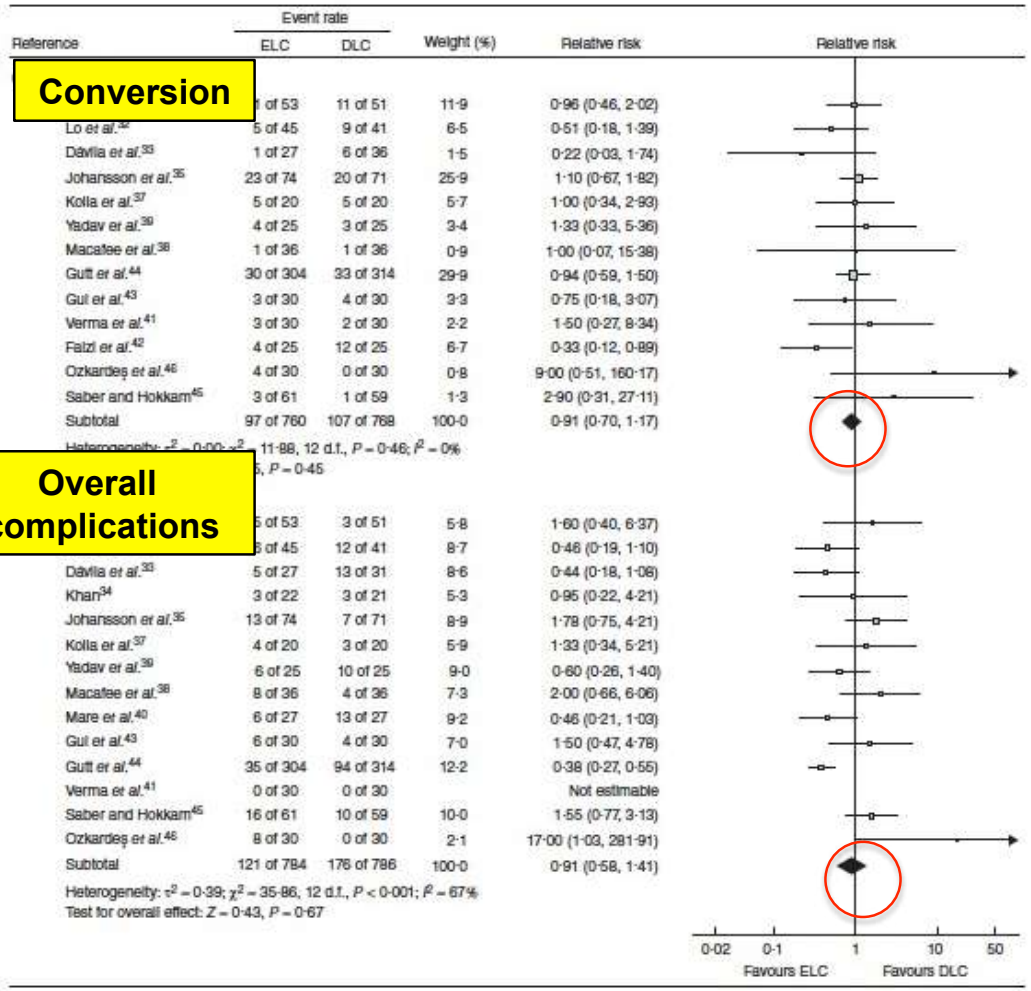
Fig. 4 Forest plots comparing **a** wound infection, **b** bile duct injury, **c** bile leakage, **d** conversion to open surgery and **e** overall complications in early laparoscopic cholecystectomy (ELC) and delayed laparoscopic cholecystectomy (DLC) groups. A Mantel–Haenszel random-effects model was used. Relative risks are shown with 95 per cent c.i. *Figure 4* continued on next page.

Conversion

Overall complications

Meta-analysis comparing early *versus* delayed lapa cholecystectomy for acute cholecystitis

Wu X-D, ***British Journal of Surgery****, 2015*



SOMETIMES : it's not a piece of cake …

ORIGINAL ARTICLE

A preoperative predictive scoring system to predict the ability to achieve the critical view of safety during laparoscopic cholecystectomy for acute cholecystitis

Table 3 Predictive scoring system for creation of the CVS

Predictive factor	Points contributed
CRP	
≤5.5 mg/dl	0 point
>5.5 mg/dl	2 points
Gallstone impaction	
Present	1 point
None	0 point
Time from symptom onset to operation	
≤72 h	0 point
>72 h	2 points

Table 5 Comparison of sensitivity, specificity, positive predictive value, and negative predictive value for creation of the CVS

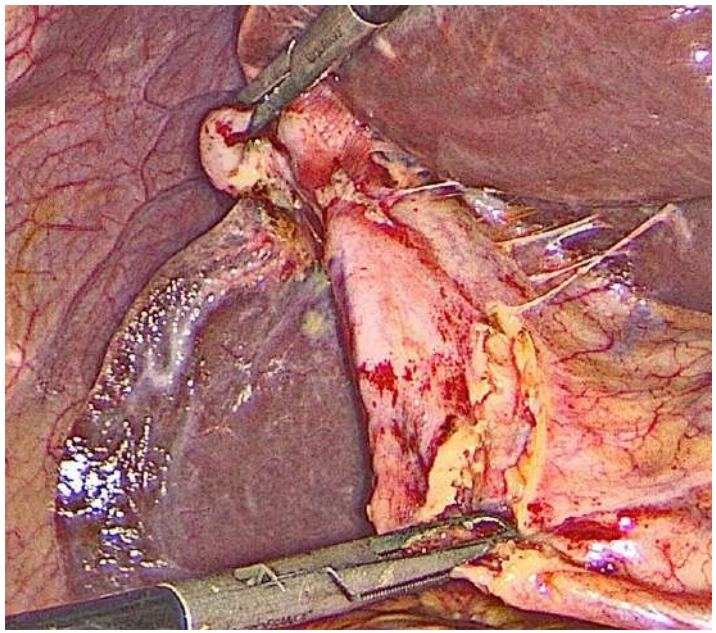
Variable	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
Total score > 2	91	71	45	97
Total score > 3	78	88	62	94
Total score > 4	57	96	76	96
Moderate/severe AC (Grade 2/3[10])	78	78	47	93

AC, acute cholecystitis.

*Onoe, **HBP**, 2017*

INFLAMMATION

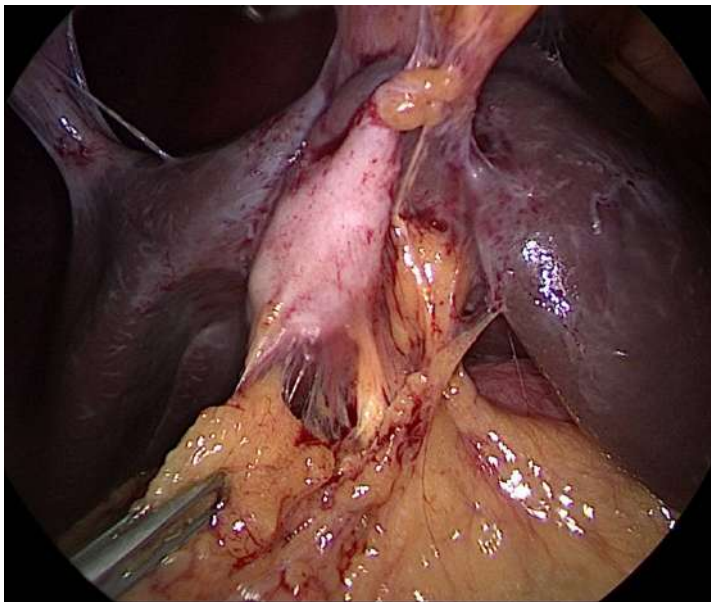
SEVERE CHRONIC CHOLECYSTITIS



- Shrunken, contracted and intrahepatic gallbladder
- Hepatocystic triangle with biliary inflammatory fusion
- Inflammation can extend to porta hepatis.

INFLAMMATION

SEVERE CHRONIC CHOLECYSTITIS



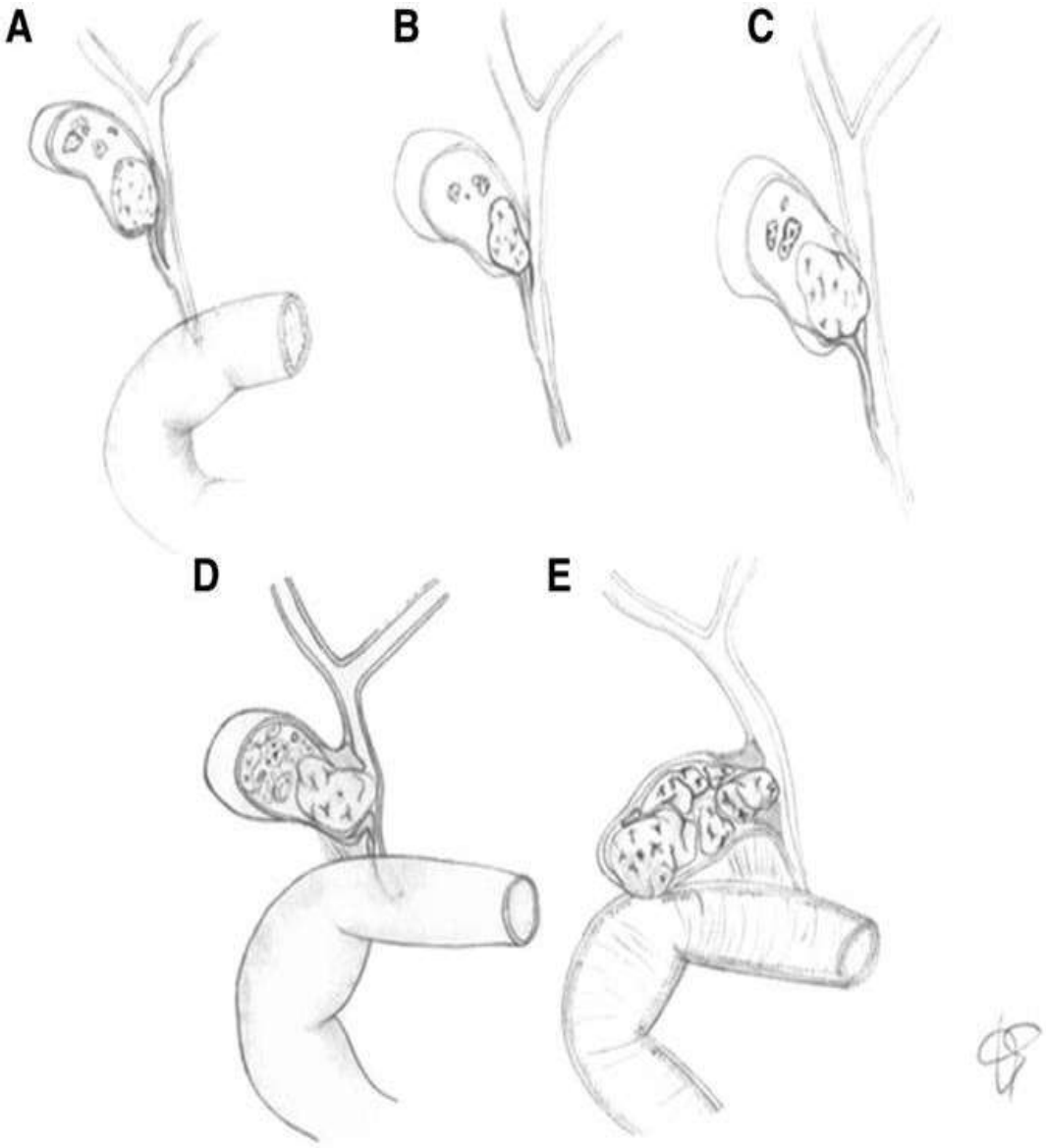
- Shrunken, contracted and intrahepatic gallbladder
- Hepatocystic triangle with biliary inflammatory fusion
- Inflammation can extend to porta hepatis.

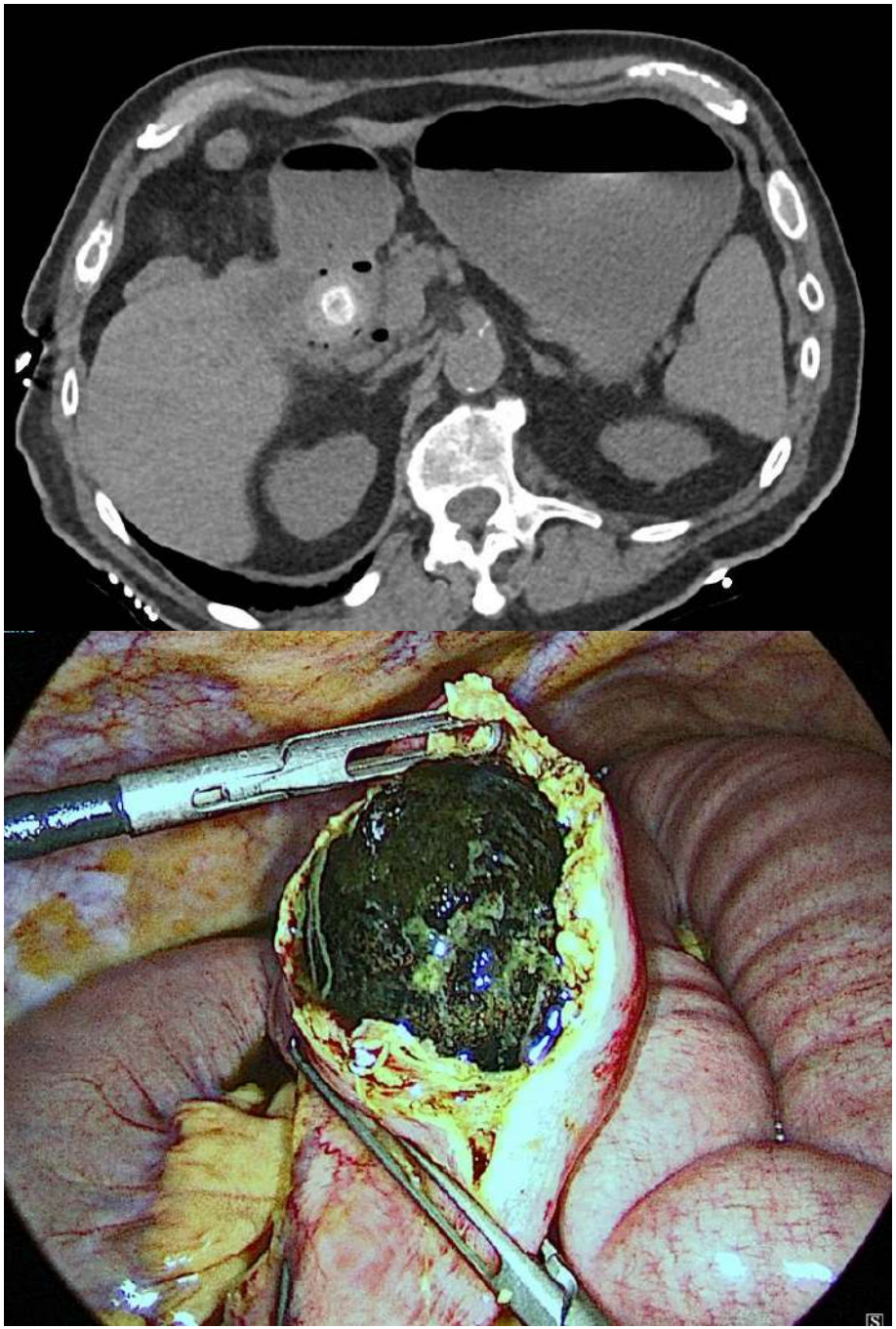
INFLAMMATION

SEVERE CHRONIC CHOLECYSTITIS

- Shrunken, contracted and intrahepatic gallbladder
- Hepatocystic triangle with biliary inflammatory fusion
- Inflammation can extend to porta hepatis.

MIRIZZI SYNDROME





HOW to MANAGE the DIFFICULT ONE ?

NON OPERATIVE MANAGEMENT / CHOLECYSTOSTOMY

PEROPERATIVELY

CALL FOR HELP

BAILOUT PROCEDURES

FUNDUS FIRST APPROACH

SUBTOTAL CHOLECYSTECTOMY

CONVERSION TO OPEN CHOLECYSTECTOMY

NON OPERATIVE MANAGEMENT

CHOLECYSTOSTOMY

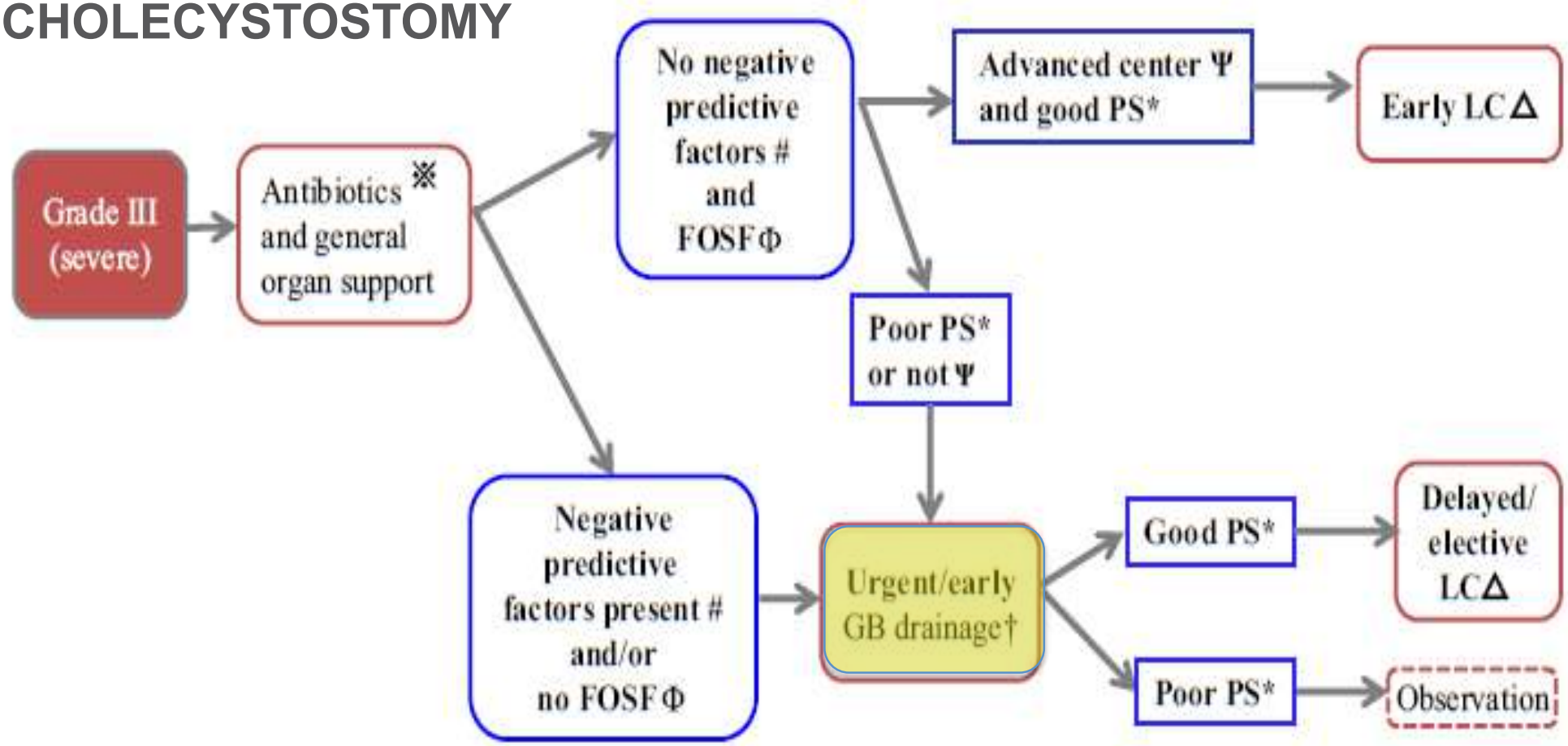


Fig. 10 TG18 flowchart for the management of acute cholecystitis Grade III. ※, performance of a blood culture should be taken into consideration before initiation of administration of antibiotics; #, negative predictive factors: jaundice (TBil ≥2), neurological dysfunction, respiratory dysfunction; Φ, FOSF: favorable organ system failure = cardiovascular or renal organ system failure which is rapidly reversible after admission and before early LC in AC; *, in cases of Grade III, CCI (Charlson comorbidity index) 4 or greater, ASA-PS 3 or greater are high risk; †, a bile culture should be performed during GB drainage; Ψ, advanced center = intensive care and advanced laparoscopic techniques are available; Δ, in case of serious operative difficulty, bail-out procedures including conversion should be used. *GB* gallbladder, *LC* laparoscopic cholecystectomy, *PS* performance status [Colour figure can be viewed at wileyonlinelibrary.-

BAIL OUT PROCEDURES

FUNDUS FIRST APPROACH

Fundus-first laparoscopic cholecystectomy

A safe means of reducing the conversion rate

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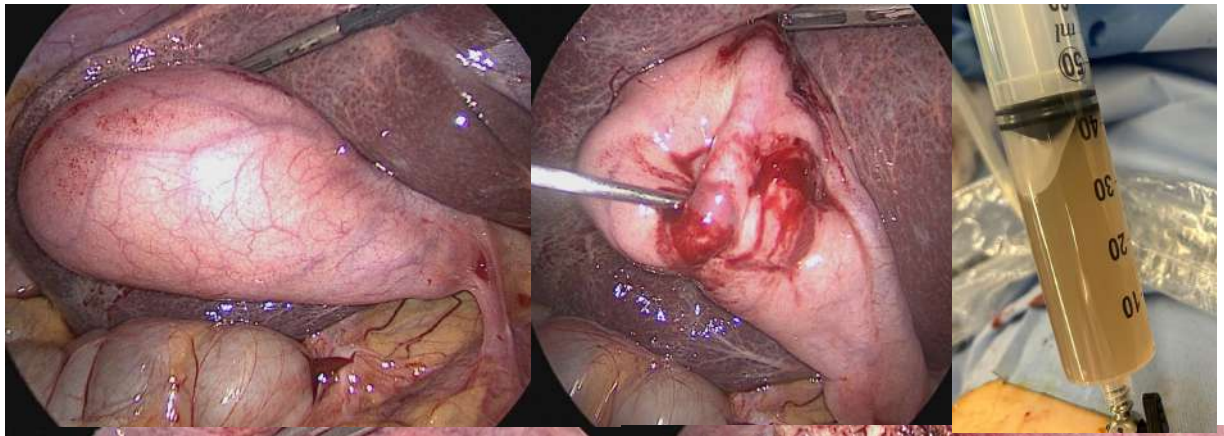
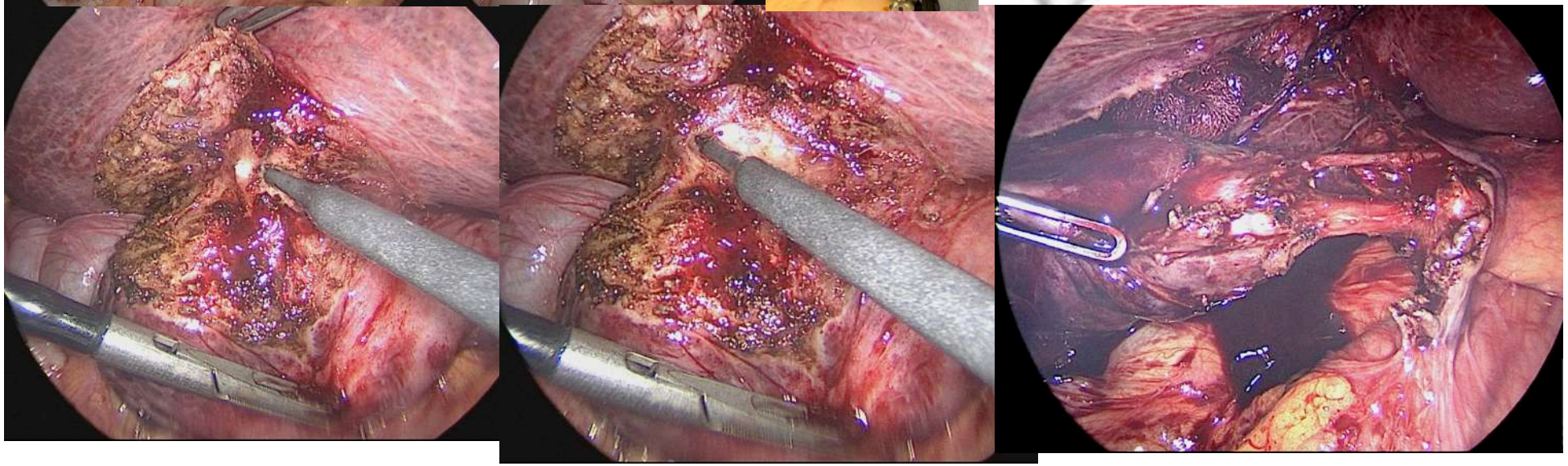
Upper Gastrointestinal and Laparoscopic Service, Department of Surgery, Vale of Leven District Hospital, Dunbartonshire, Scotland, G83 OUA, United Kingdom

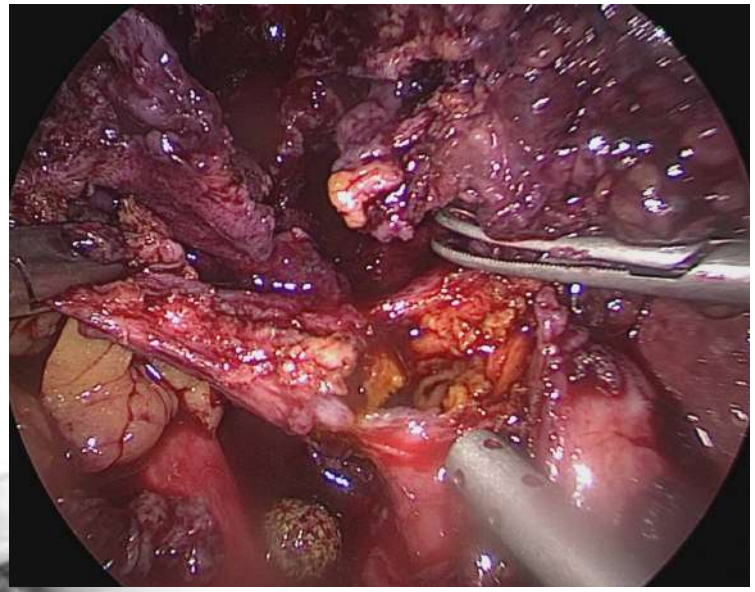
Received: 25 June 2001/Accepted in final form: 6 September 2001/Online publication: 17 December 2001

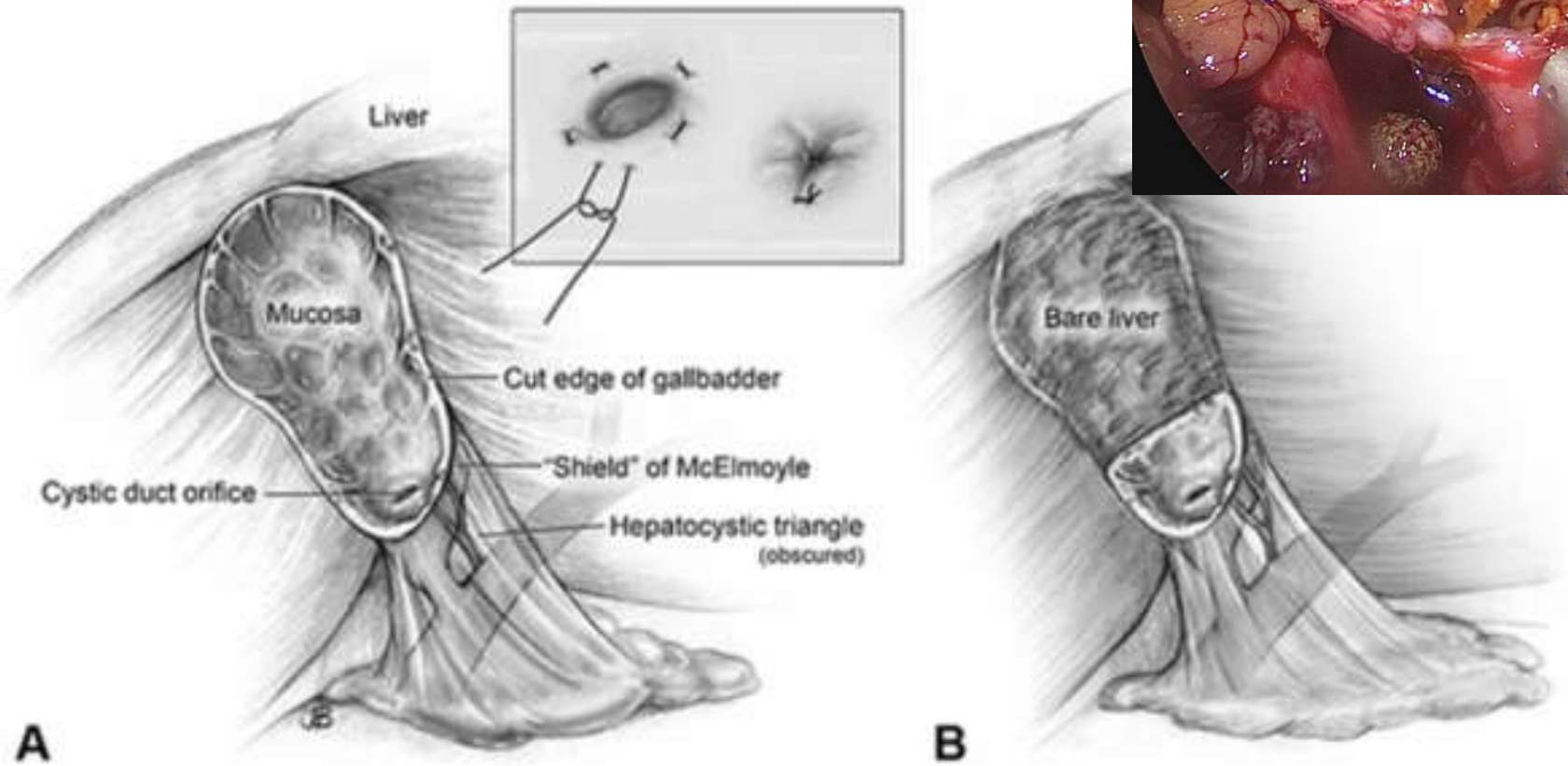




BAIL OUT PROCEDURES

SUBTOTAL FENESTRATING CHOLECYSTECTOMY

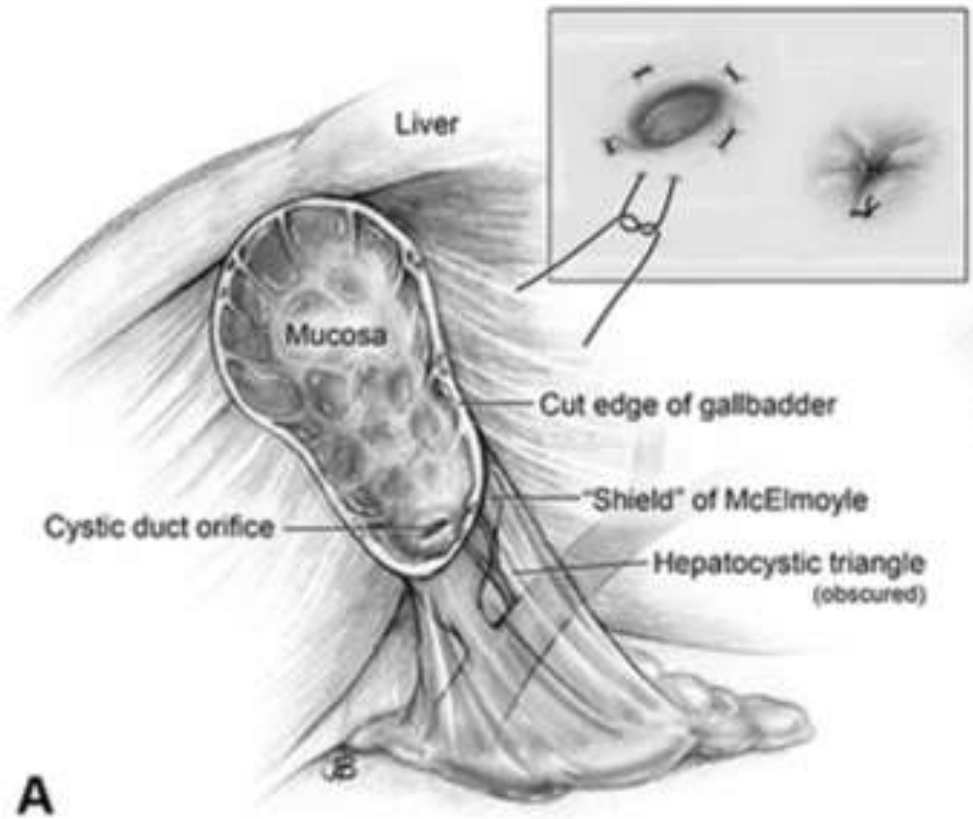


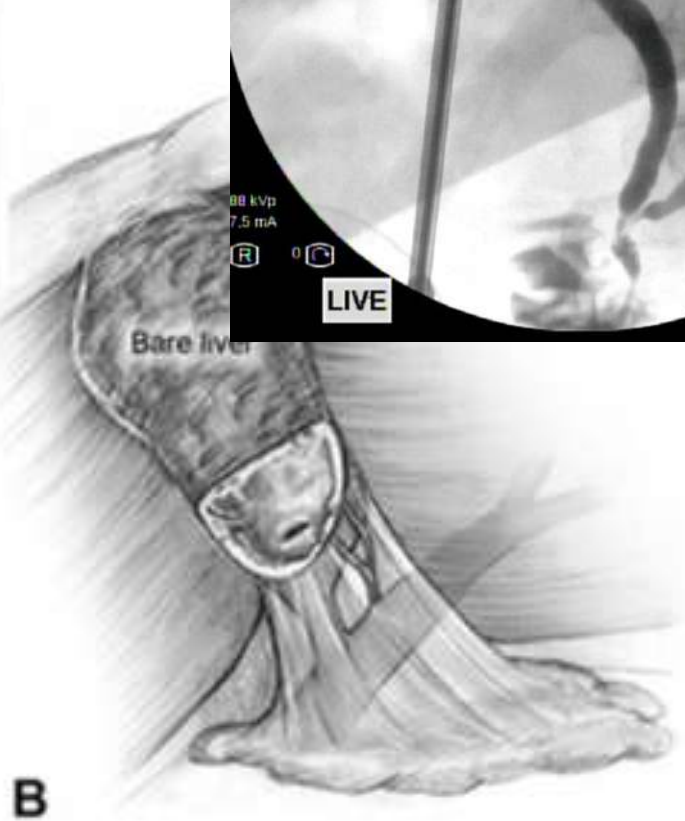


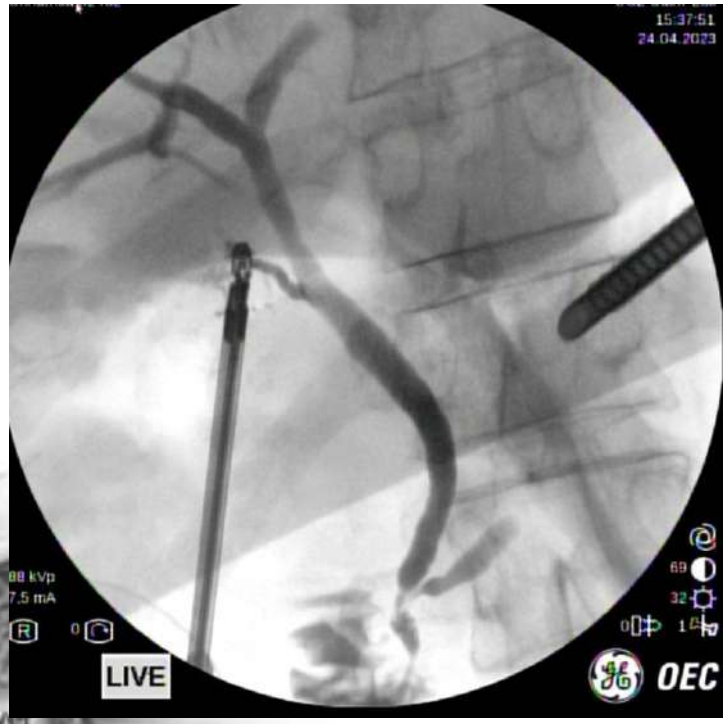
*Strasberg, **J Am Coll Surg,** 2016*

BAIL OUT PROCEDURES

SUBTOTAL FENESTRATING CHOLECYSTECTOMY







*Strasberg, **J Am Coll Surg,** 2016*

BAIL OUT PROCEDURES

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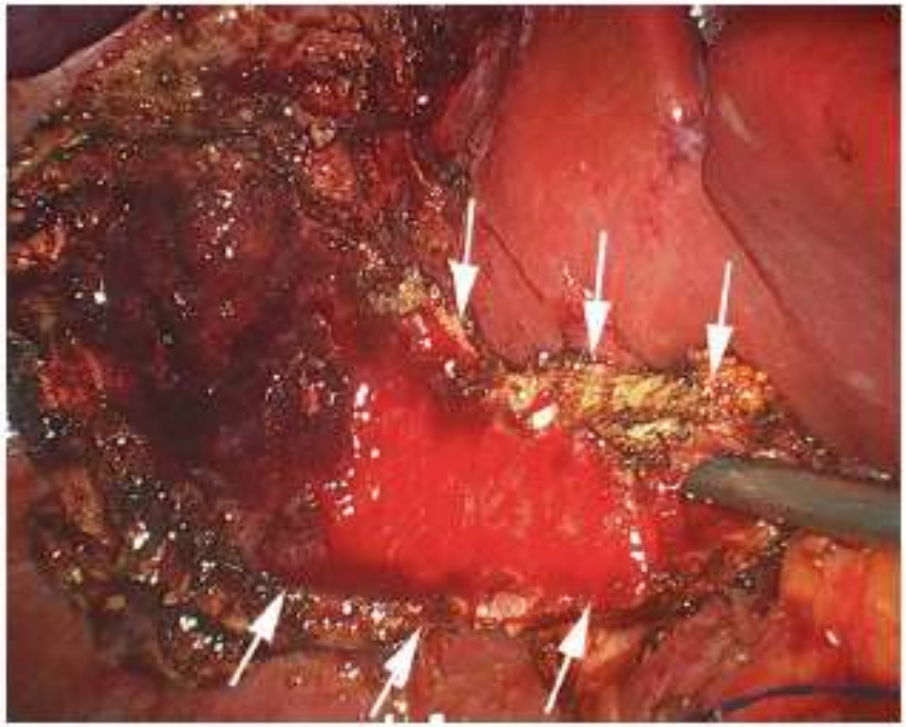
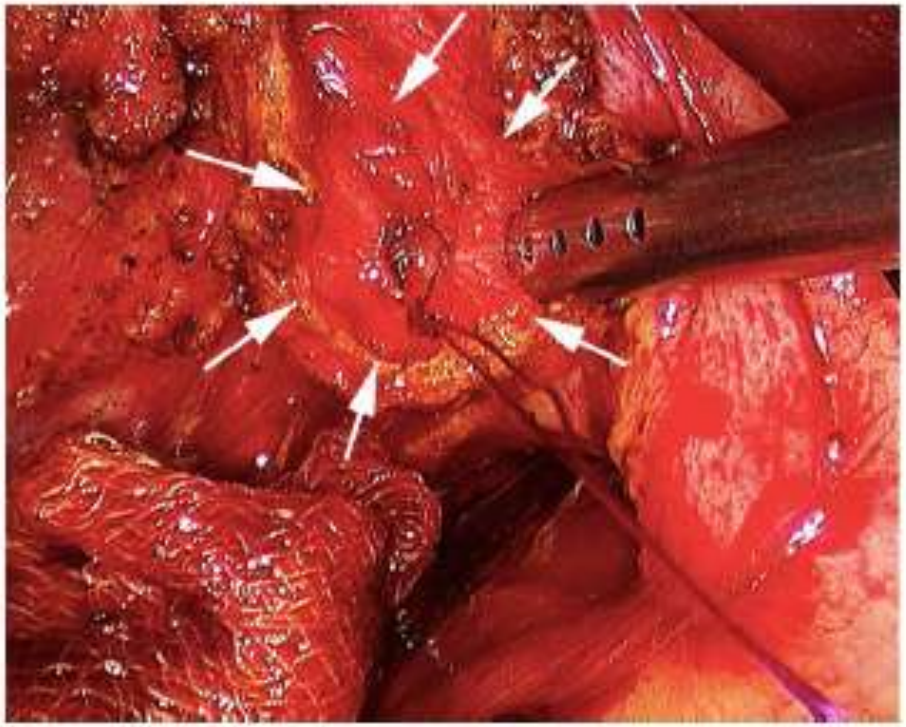
SUBTOTAL FENESTRATING CHOLECYSTECTOMY

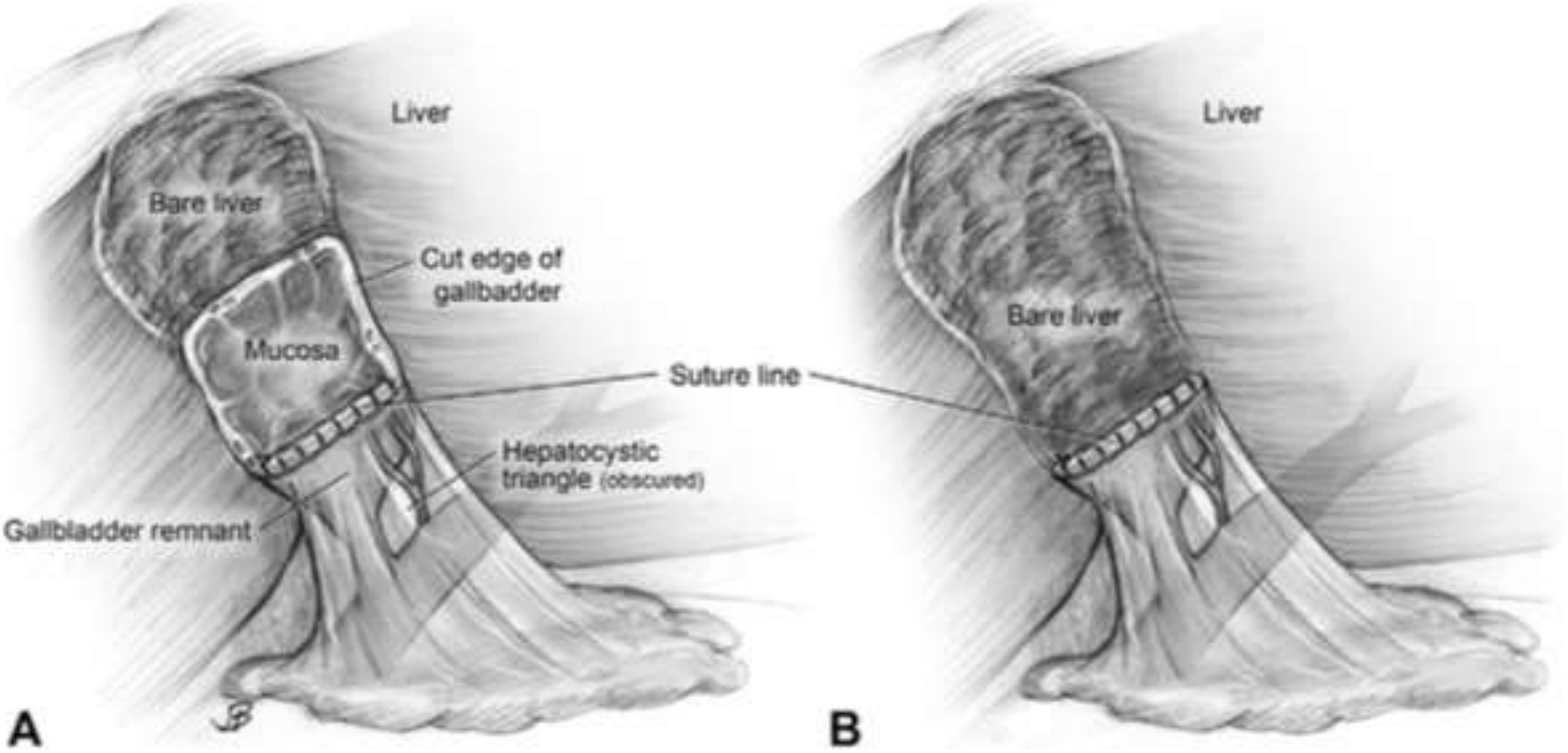




Hubert, ***Surg Endosc***, *2010*

BAIL OUT PROCEDURES

SUBTOTAL RECONSTITUING CHOLECYSTECTOMY



*Strasberg, **J Am Coll Surg,** 2016*

BAIL OUT PROCEDURES

CONVERSION TO OPEN CHOLECYSTECTOMY

Table III. Reasons for conversion to open cholecystectomy

Reason	*n (%)*
Adhesions	39 (34.8)
Inflammation	36 (32.1)
Anatomy	33 (29.5)
Injury	13 (11.6)
Common bile duct stones	6 (5.4)
Other	4 (3.6)
Multiple reasons	19 (17.0)

*Lipman, **Surgery,** 2007*

BAIL OUT PROCEDURES

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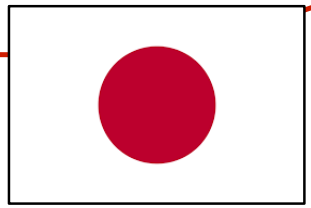
CONVERSION TO OPEN CHOLECYSTECTOMY

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



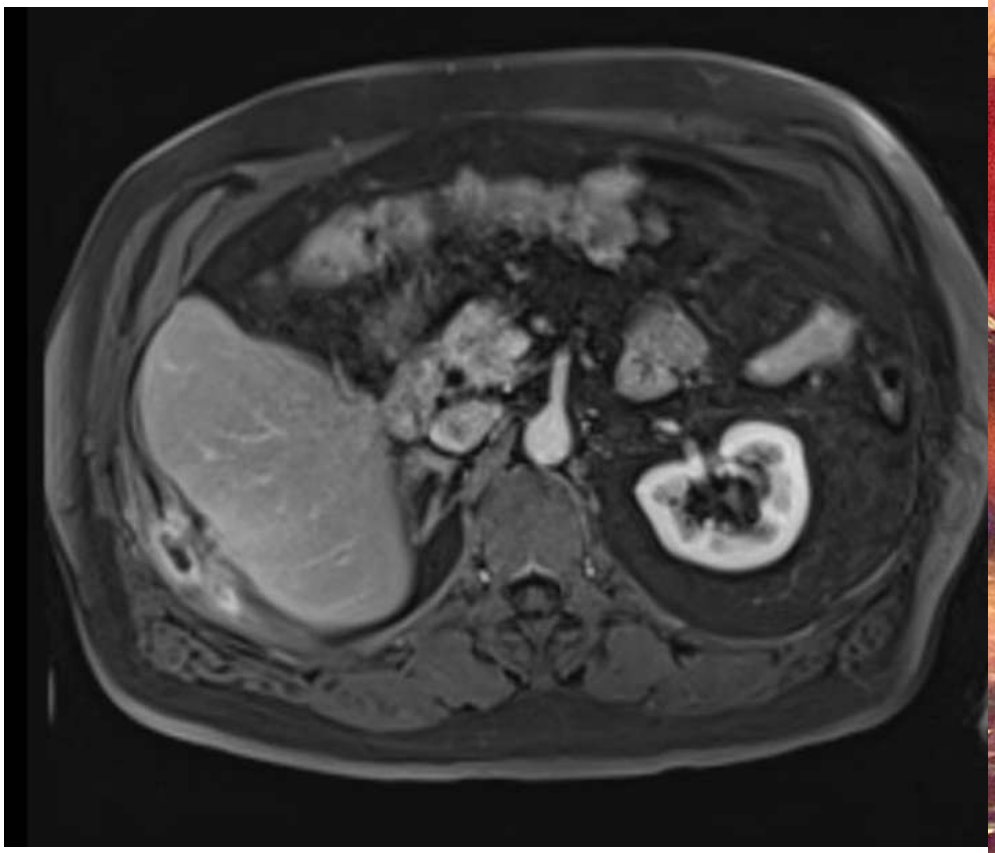
Tokyo Guidelines 2018: diagnostic criteria and severity grading of acute cholecystitis (with videos)

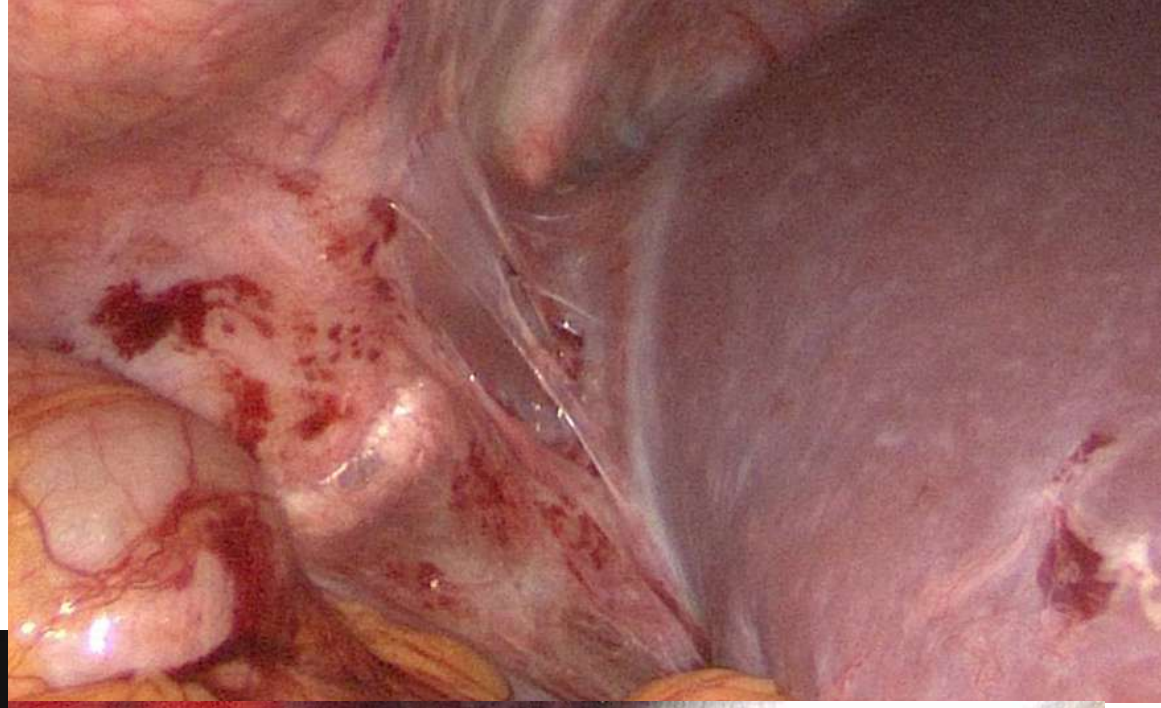
Masamichi Yokoe · Jiro Hata · Tadahiro Takada · Steven M. Strasberg · Horacio J. Asbun · Go Wakabayashi · Kazuto Kozaka · Itaru Endo · Daniel J. Deziel · Fumihiko Miura · Kohji Okamoto · Tsann-Long Hwang · Wayne Shih-Wei Huang · Chen-Guo Ker · Miin-Fu Chen · Ho-Seong Han · Yoo-Seok Yoon · In-Seok Choi · Dong-Sup Yoon · Yoshinori Noguchi · Satoru Shikata · Tomohiko Ukai · Ryota Higuchi · Toshifumi Gabata · Yasuhisa

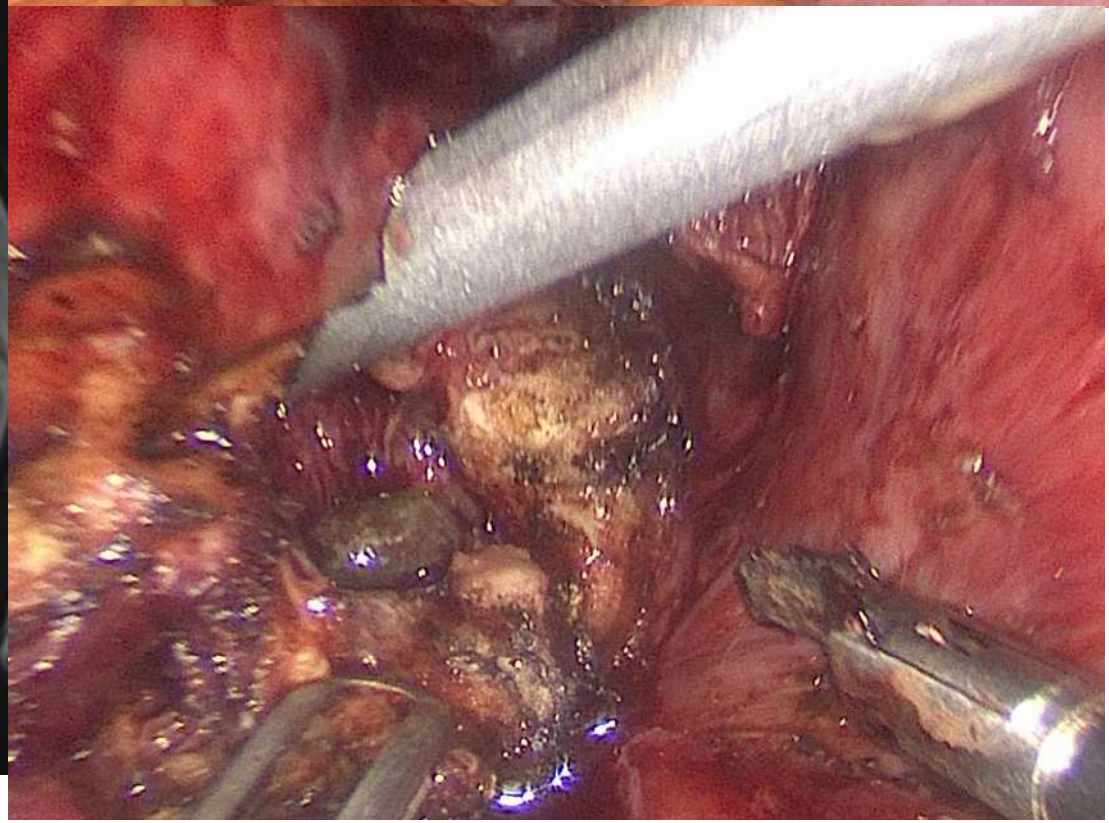
GALLSTONES RETRIEVAL

2019: Cholecystectomy

2023: Chronic costal pain and fever







BILE DUCT ASSESSMENT

INTRA OPERATIVE CHOLANGIOGRAPHY (IOC)

Original article

Selective intraoperative cholangiography and risk of bile duct injury during cholecystectomy

B. Törnqvist[1], C. Strömberg[1], O. Akre[2], L. Enochsson[1] and M. Nilsson[1]

[1]Department of Clinical Science, Intervention and Technology, Division of Surgery, and [2]Department of Medicine, Solna, Karolinska Institutet, Stockholm, Sweden

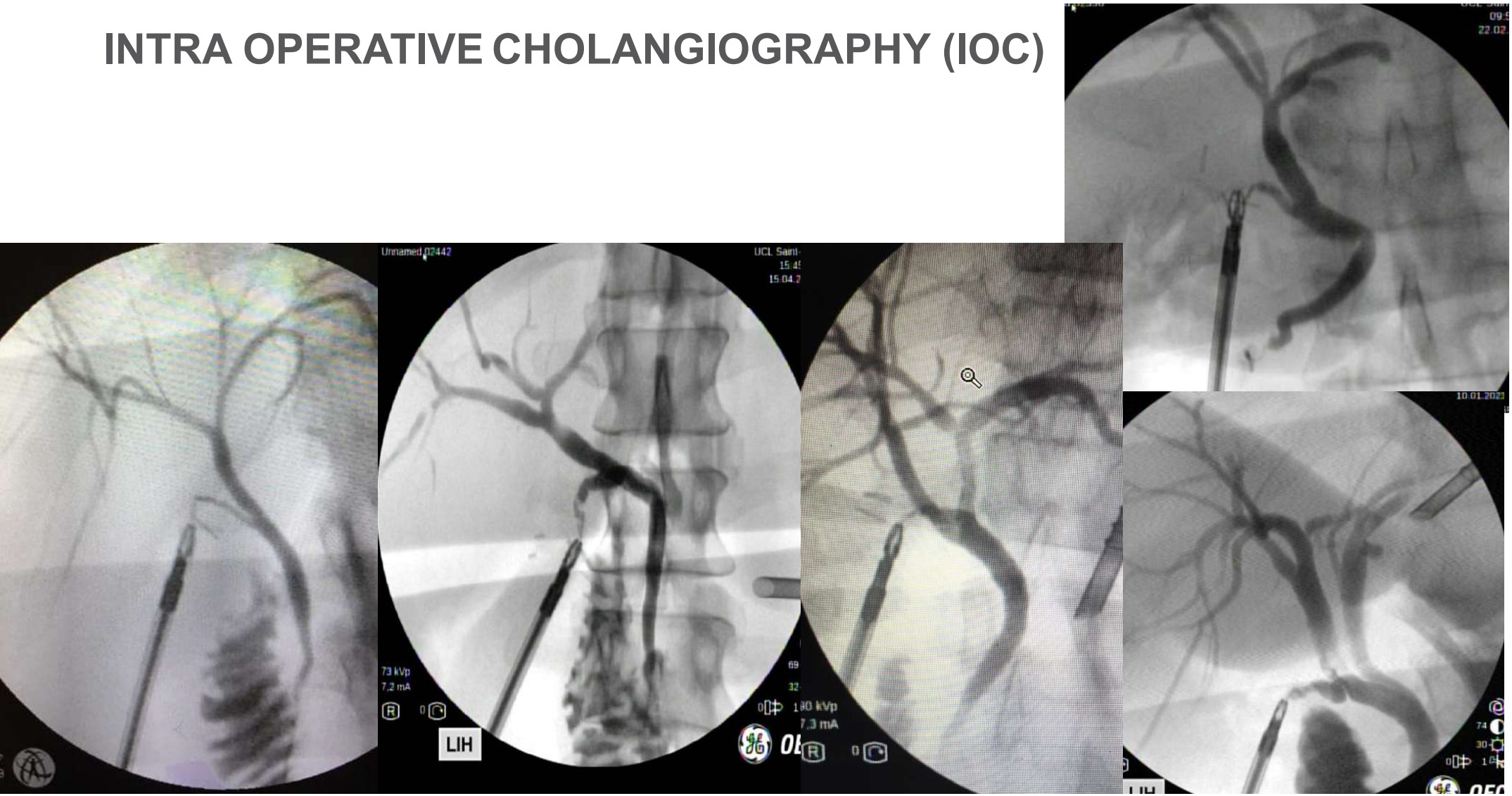
Correspondence to: Dr B. Törnqvist, Department of Clinical Science, Intervention and Technology, Division of Surgery, Karolinska Institutet, SE-141 86 Stockholm, Sweden (e-mail: bjorn.tornqvist@ki.se)

Br J Surg, 2015

BILE DUCT ASSESSMENT

Cliniques universitaires SAINT-LUC UCLouvain BRUXELLES

INTRA OPERATIVE CHOLANGIOGRAPHY (IOC)



BILE DUCT ASSESSMENT

ICG

Original article

VIDEO AVAILABLE ONLINE

Fluorescent cholangiography illuminating the biliary tree during laparoscopic cholecystectomy

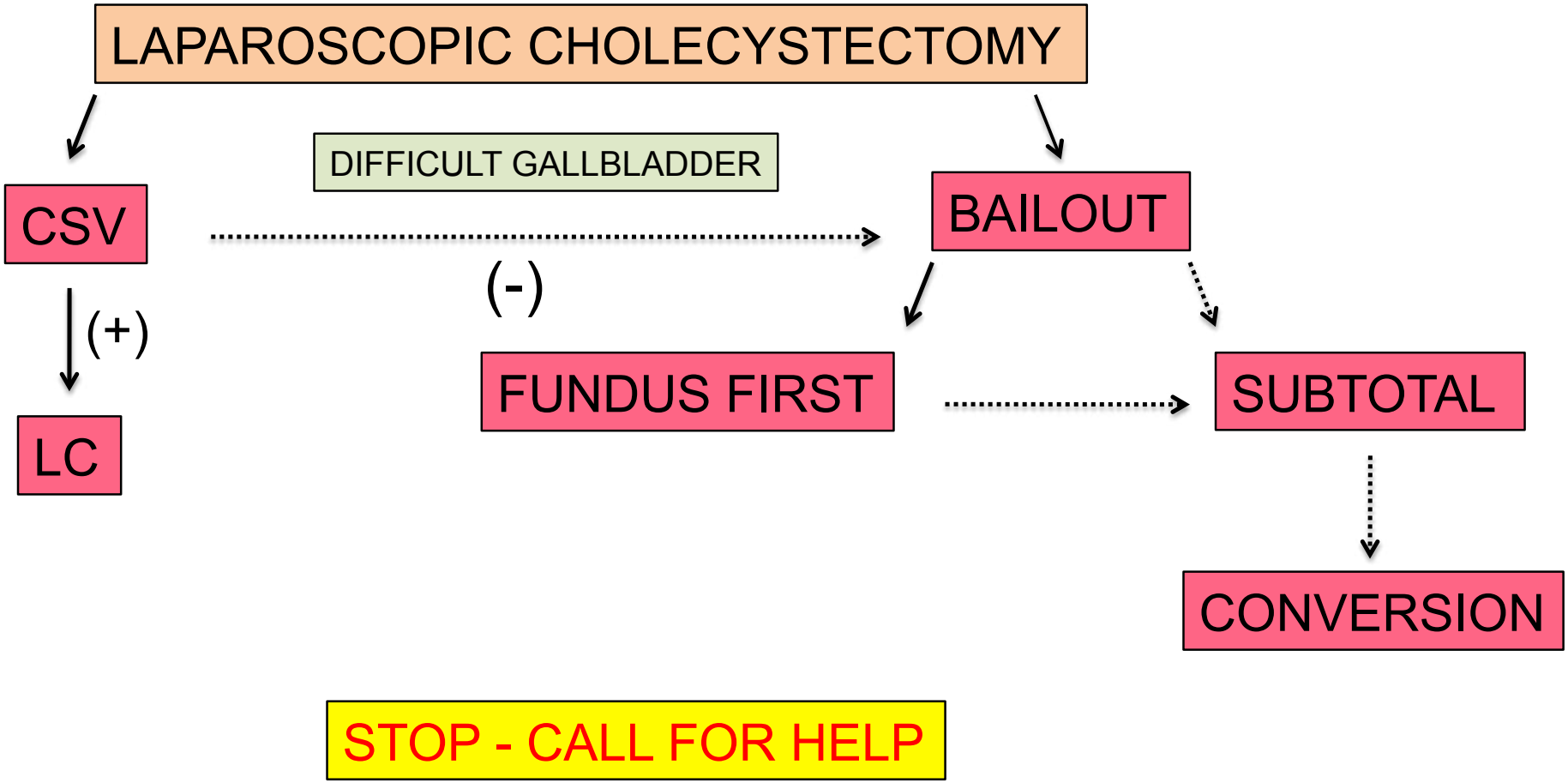
T. Ishizawa[1,2], Y. Bandai[1], M. Ijichi[1], J. Kaneko[2], K. Hasegawa[2] and N. Kokudo[2]

[1]Department of Surgery, Central Hospital of Social Health Insurance, and [2]Hepato-Biliary-Pancreatic Surgery Division, Department of Surgery, Graduate School of Medicine, University of Tokyo, Tokyo, Japan

Correspondence to: Dr N. Kokudo, Hepato-Biliary-Pancreatic Surgery Division, Department of Surgery, Graduate School of Medicine, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8655, Japan (e-mail: kokudo-2su@h.u-tokyo.ac.jp)

Br J Surg, 2015

CONCLUSION



STOP - CALL FOR HELP

TAKE HOME MESSAGES

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LC = frequent for benign disease

50% biliary variations

Primary goal of LC = « safety first »

Achieving CVS - intention to perform IOC

Liberal use of **bail out techniques** – subtotal cholecystectomy

Open conversion

Do not stay alone