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# Indications for Intra-operative Cholangiogram

*CaseConference*

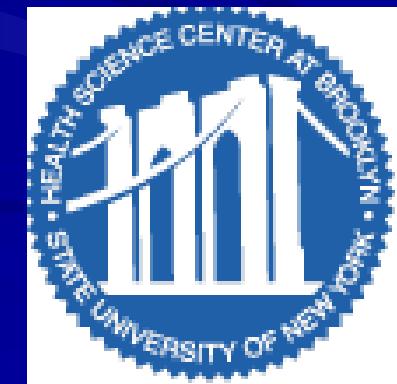
*SUNY Downstate Medical Center*



**Jacob Eisdorfer, DO**



August 4, 2011



# Case

■ **37y/o M presented to the ER**

- Known h/o gallstones
- Constant RUQ pain X 5days
- Jaundice

■ **PMHx: Denies**

■ **PSHx: Denies**

# Case

## ■ Physical Exam:

– VS: 97.7    69    17    123/80

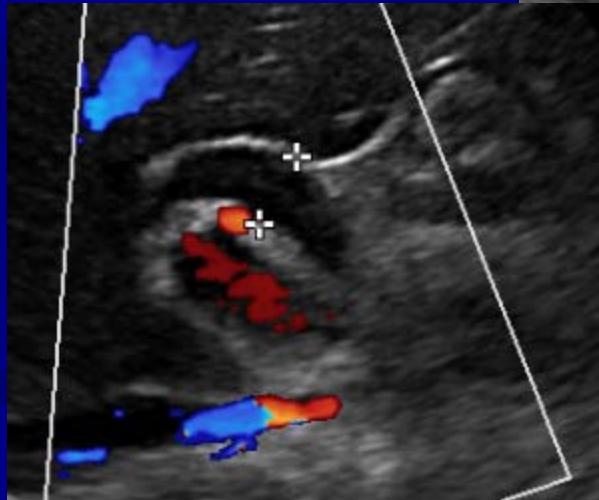
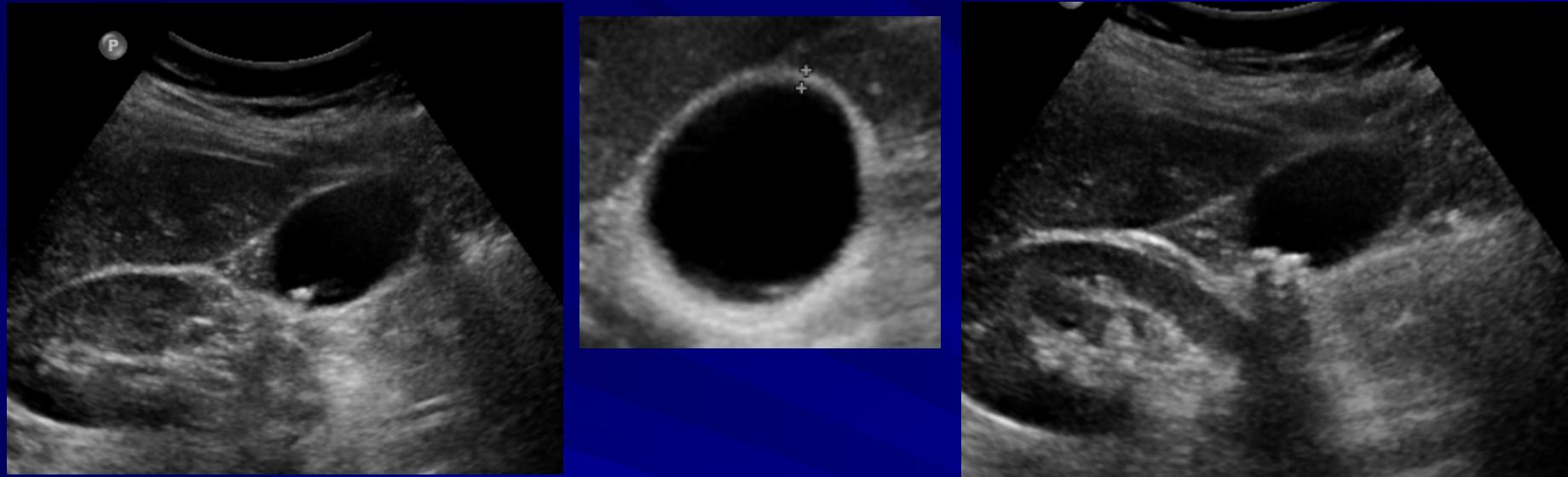
■ Scleral & dermal icterus

■ Abdomen: soft, Nondistended, (+)RUQ tenderness; mild epigastric tenderness No Murphy's sign, No rebound or Guarding

## ■ Labs:

– WBC: 4.8 TBili 5.9 AlkP 255 AST 184 ALT 454 Amy 56 Lip 29

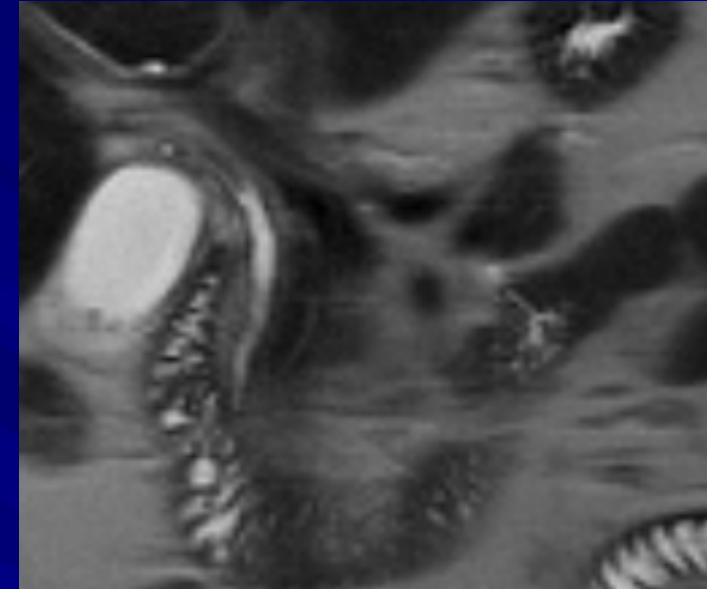
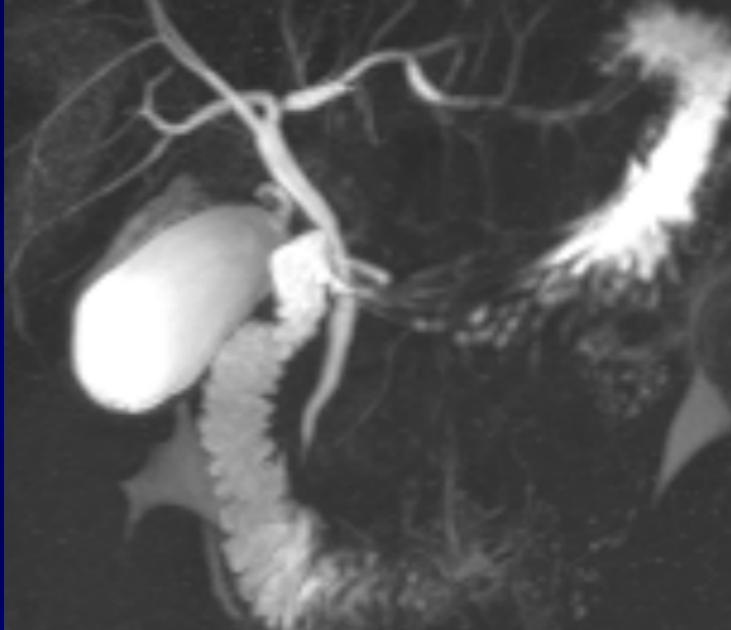
# Ultrasound



# Ultrasound

- Cholelithiasis
- No Pericholecystic fluid
- Gall Bladder Wall: 3.4mm
- CBD: 1.18cm.

# Hospital Day # 2: MRCP



- Common Bile Duct Patent and of normal caliber without evidence of filling defects
- 2 to 4 mm layering filling defects are seen in the gallbladder fundus
- Gallbladder without evidence of wall thickening
  - Labs: Tbili: 5.2, AlkP: 228

# Hospital Day #3

## ■ Laparoscopic Cholecystectomy

- JP Drain Placed because of bile spillage from fundus of GB
- Evening Labs:
  - Tbili: 3.6, AlkP: 198
- AM Labs (POD#1):
  - Tbili: 3.3, AlkP: 204
- Discharged home

## POD # 3

- **Return to ED for Evaluation and Drain Removal**
  - **Labs:** Tbili: 2.2, AlkP: 217
  - **Drain Removed**

## POD #4

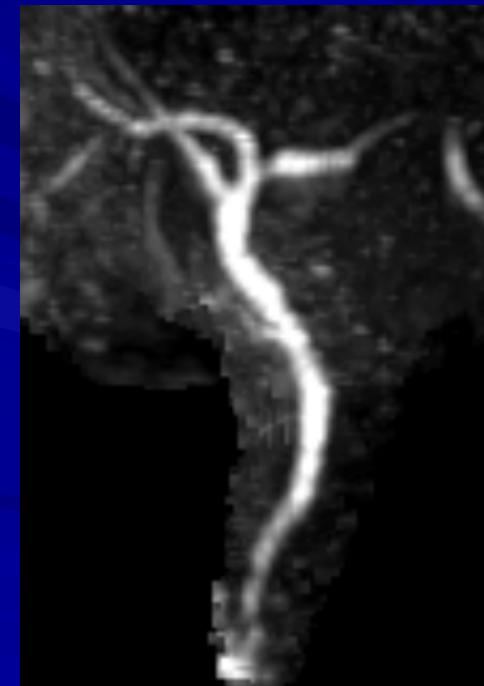
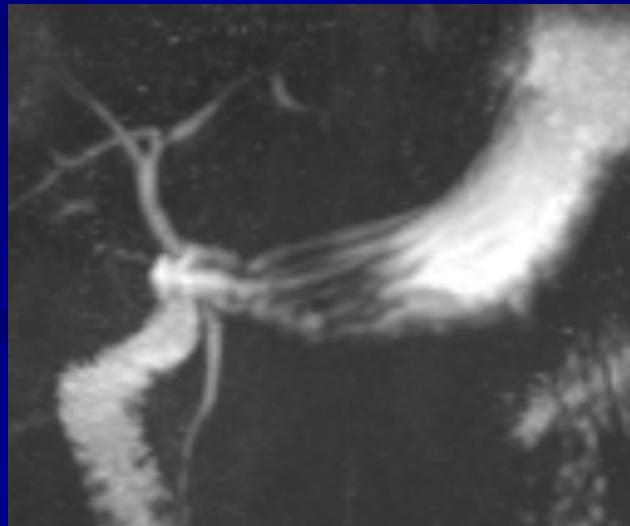
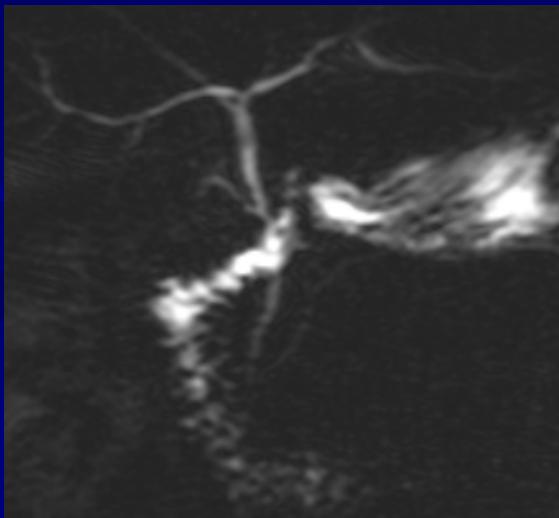
### ■ Returned to ER with RUQ Pain

- **Labs:** Tbili: 2.6, AlkP: 364
- Arrangements made for MRCP then ERCP if MRCP is abnormal

# POD#6

## ■ Returned to Clinic

- Labs: Tbili: 2.6, AlkP: 521
- **MRCP:** CBD normal caliber measuring 4 mm.  
No significant intrahepatic biliary ductal dilatation. No choledocholithiasis.



## POD # 11

- Returned to ER for Labs
  - Labs: TBili: 1.3 AlkP: 262
  - Feels fine

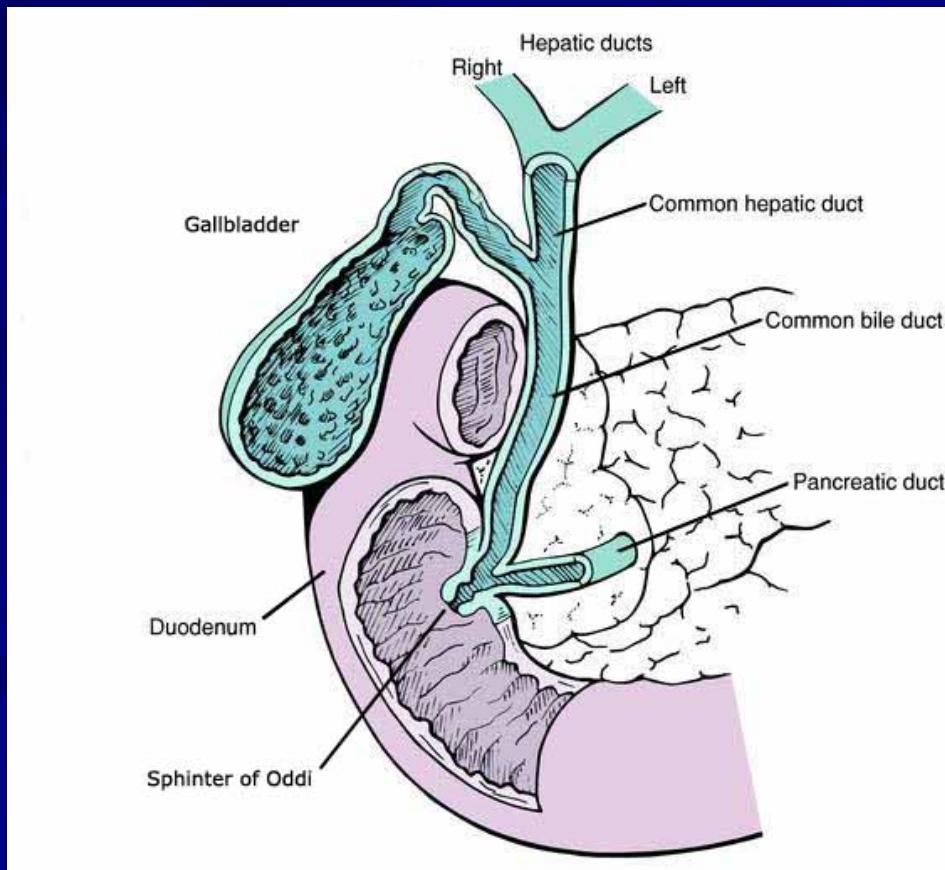
# Intraoperative Cholangiogram

## ■ Agenda:

- Anatomy
- History
- Routine vs. Selective use
- Preoperative predictors of Choledocholithiasis
- MRCP / EUS
- Algorithm
- Summary

# Intraoperative Cholangiography

## ■ Anatomy:



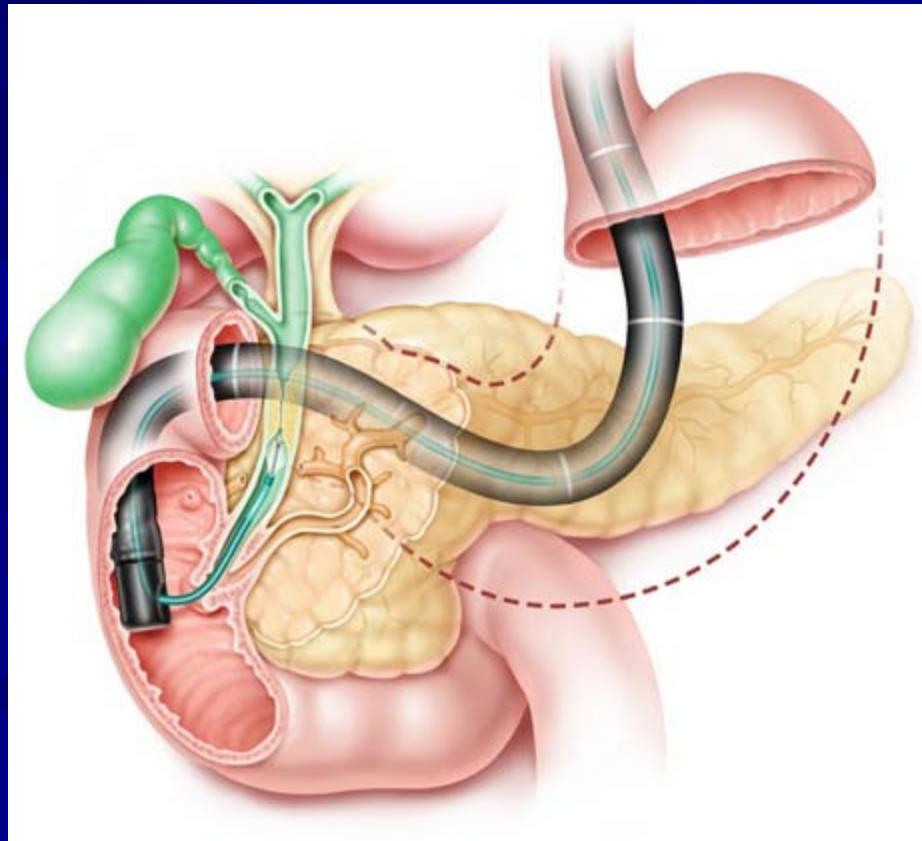
# Intraoperative Cholangiography

- Anatomy:



# Intraoperative Cholangiography

## ■ Anatomy:



# Intraoperative Cholangiography

## ■ History

- Reich in 1918
  - First to visualize the extrahepatic biliary tree
  - Injected bismuth and petrolatum and defined a biliary fistula
- Mirizzi in 1932
  - First series of intraoperative cholangiograms
  - Using static films
- Berci and colleagues in 1978
  - Mobile C-arm image intensifier using a TV monitor

MacFadyen BV. Intraoperative cholangiography: past, present, and future. Surg Endosc. 2006 Apr;20 Suppl 2:S436-40. Epub 2006 Mar 23. (Agusta, GA)

# Intraoperative Cholangiography

## ■ Arguments for Routine Intraoperative Cholangiography

- Detection of Bile Stones
  - 5%
- Detection of anatomical ductal abnormalities
  - 12%
- CBD injury without IOC
  - 0.4-0.6%
- CBD injury with IOC
  - 0.2-0.4%

Flum DR, Dellinger EP, Cheadle A, Chan L, Koepsell T. Intraoperative cholangiography and risk of common bile duct injury during cholecystectomy. JAMA. 2003 Apr 2;289(13) (Seattle)

# Intraoperative Cholangiography

- Arguments Against Routine Intraoperative Cholangiography
  - Cannot be performed in 5%-9%
  - Does not eliminate CBD injury
    - Only part of the process
      - Meticulous dissection & visualization more important

Cuschieri, A., Dubois, F., Mouiel, J., Mouret, P., Becker, H., Buess, G., Trede, M., Troidl, H.: The European experience with laparoscopic cholecystectomy. Am. J. Surg. 161:385, 1991

Gillams, A., Cheslyn-Curtis, S., Russell, R.C.G., Lees, W.R.: Can cholangiography be safely abandoned in laparoscopic cholecystectomy? Ann. R. Coll. Surg. Engl. 74:248, 1992

# Intraoperative Cholangiography

## ■ Arguments Against Routine Intraoperative Cholangiography (Cont')

- Small stones that are not suspected clinically are likely to be insignificant
- False positives & False Negatives
- MRCP
- ERCP
- Increased Operating Time & Cost (?)

Cuschieri, A., Dubois, F., Mouiel, J., Mouret, P., Becker, H., Buess, G., Trede, M., Troidl, H.: The European experience with laparoscopic cholecystectomy. Am. J. Surg. 161:385, 1991 (UK)

Gillams, A., Cheslyn-Curtis, S., Russell, R.C.G., Lees, W.R.: Can cholangiography be safely abandoned in laparoscopic cholecystectomy? Ann. R. Coll. Surg. Engl. 74:248, 1992 (UK)

# Intraoperative Cholangiography

## ■ Indications for IOC:

- Elevated preoperative liver enzymes
- Unclear anatomy during laparoscopic dissection
- Dilated CBD on preoperative imaging
- Gallstone Pancreatitis without endoscopic clearance of CBD
- Jaundice
- Many small stones in gall bladder
- Unsuccessful preoperative ERCP for choledocholithiasis

Chari RS, Shah SA. Biliary System. In: Townsend CM Jr, Beauchamp DR, Evers BM, Mattox KL eds. *Sabiston Textbook of Surgery*. 18th ed. Philadelphia, PA : SAUNDERS ELSEVIER , 2008. p 1565

# Intraoperative Cholangiography

## ■ Predictors of CBD Stones:

- Studies are all over the place

- Elevated Early On:

  - alanine aminotransferase (ALT)

- Later:

  - Bilirubin, AlkP, GGT

Prat F, Meduri B, Ducot B, Chiche R, Salimbeni-Bartolini R, Pelletier G Prediction of common bile duct stones by noninvasive tests Ann Surg. 1999;229(3):362. (Paris)

# Intraoperative Cholangiography

## ■ Meta-Analysis of 22 studies

TABLE 3 -- Sensitivity and Specificity

Indicator	Sensitivity	95% CI	Specificity	95% CI
CBDS on US	0.38	0.27-0.49	1.00	0.99-1.00
Cholangitis	0.11	0.02-0.19	0.99	0.99-1.00
Preop jaundice	0.36	0.26-0.45	0.97	0.95-0.99
Dilated CBD on US	0.42	0.28-0.56	0.96	0.94-0.98
Amylase	0.11	0.02-0.20	0.95	0.93-0.98
Pancreatitis	0.10	0.08-0.12	0.95	0.93-0.97
Jaundice	0.39	0.29-0.49	0.92	0.88-0.97
Bilirubin	0.69	0.48-0.90	0.88	0.84-0.92
Alk phos	0.57	0.46-0.69	0.86	0.78-0.94
Cholecystitis	0.50	0.11-0.89	0.76	0.45-1.00

Abboud PA, Malet PF, Berlin JA, Staroscik R, et al. Predictors of common bile duct stones prior to cholecystectomy: a meta-analysis . Gastrointest Endosc. 1996;44(4):450. (UPenn)

# Intraoperative Cholangiography

- Retrospective - 1002 patients who underwent laparoscopic cholecystectomy for cholelithiasis
- Met indication for ERCP
- Found to have CBD stone on ERCP

**Table 1** Predictors of common bile duct stones in patients undergoing laparoscopic cholecystectomy

Clinical predictors	Sensitivity	Specificity	Likelihood ratio	Accuracy	Predictive value		P value
					Positive	Negative	
ERCP, n = 199	96.0	99.1	107.3	98.0	98.8	97.4	0.000
Sonography, n = 926	35.7	97.9	8.1	93.2	58.1	94.9	0.000
CT scan, n = 232	74.5	89.5	7.1	86.2	66.7	92.6	0.000
MRI, n = 32	75.0	87.5	6.0	84.4	66.7	91.3	0.002
CBD diameter, n = 994	54.5	91.8	6.6	88.7	38.8	95.4	0.000
Serum amylase, n = 304	45.5	91.8	1.6	67.4	21.1	88.5	0.035
GGT, n = 1002	84.1 →	72.0	3.0	75.7	22.4	97.9	0.000
ALP, n = 1002	79.5 ←	72.9	2.9	73.5	22.0	97.4	0.000
TB, n = 1002	48.9	87.5	3.9	84.1	27.4	94.7	0.000
ALT, n = 1002	71.6 →	68.2	2.3	68.5	17.8	96.1	0.000
AST, n = 1002	63.6	78.7	3.0	72.4	22.3	95.7	0.000
GGT+ALP+TB+ ALT+AST, n = 1002	87.5	53.3	1.8	63.4	15.3	97.8	0.000

GGT: gamma glutamyl transferase, ALP: alkaline phosphatase, TB: total bilirubin, ALT: alanine aminotransferase, AST: aspartate aminotransferase, CT: computed tomography, MRI: magnetic resonance imaging, ERCP: endoscopic retrograde cholangiopancreatography, CBD: common bile duct, GGT+ALP+TB+ALT+AST: at least one abnormal elevation of five biochemical values

Yang MH, Chen TH, Wang SE, Tsai YF, Su CH, Wu CW, Lui WY, Shyr YM. Biochemical predictors for absence of common bile duct stones in patients undergoing laparoscopic cholecystectomy. Surg Endosc. 2008;22(7):1620. (Taiwan)

# Intraoperative Cholangiography

## ■ MRCP / EUS

### – MRCP

- Meta-analysis of 67 studies (4711 patients)

- Pooled sensitivity of 95%
  - Pooled specificity of 97%

### – EUS

- Meta-Analysis of 27 studies with 2673 patients

- sensitivity of 94 percent
  - specificity of 95 percent

Romagnuolo J, Bardou M, Rahme E, Joseph L, Reinhold C, Barkun AN. Magnetic resonance cholangiopancreatography: a meta-analysis of test performance in suspected biliary disease. Ann Intern Med. 2003 Oct 7;139(7):547-57(Canada)

Tse F, Liu L, Barkun AN, Armstrong D, Moayyedi P. EUS: a meta-analysis of test performance in suspected choledocholithiasis. Gastrointest Endosc. 2008;67(2):235. (Canada)

# Intraoperative Cholangiography

- MRCP / EUS

- Pooled analysis of 301 patients from five randomized, prospective, blinded trials.

- Compared EUS with MRCP,

- no significant difference in:

- sensitivity (93 versus 85 percent)
    - specificity (96 versus 93 percent)

Ledro-Cano D. Suspected choledocholithiasis: endoscopic ultrasound or magnetic resonance cholangio-pancreatography? A systematic review. Eur J Gastroenterol Hepatol 2007; 19:1007 (Spain)

# Intraoperative Cholangiography

## ■ MRCP / EUS

- The question of slice thickness

## ■ Six studies

- MRCP slice thickness  $\geq 5$  mm
  - Sensitivity - 40%
  - Specificity – 80%
- MRCP slice thickness  $\leq 3$  mm or 3D-MRCP sequences.
  - Sensitivity - 87%,
  - Specificity - 90%,

McMahon CJ. The relative roles of magnetic resonance cholangiopancreatography (MRCP) and endoscopic ultrasound in diagnosis of common bile duct calculi: a critically appraised topic. Abdom Imaging. 2008 Jan-Feb;33(1):6-9 (Ireland)

# Intraoperative Cholangiography

## ■ MRCP / EUS

- MRCP is preferred to EUS

- Noninvasive

- However:

- Sensitivity of MRCP may be lower for small stones (<6 mm)
    - MRCP cannot detect biliary sludge → EUS can
    - EUS for patients in whom the suspicion for choledocholithiasis remains despite a "negative" MRCP

Zidi SH, Prat F, Le Guen O, Rondeau Y, Rocher L, Fritsch J, Choury AD, Pelletier G. Use of magnetic resonance cholangiography in the diagnosis of choledocholithiasis: prospective comparison with a reference imaging method Gut. 1999;44(1):118. (France)

# Intraoperative Cholangiography

## Algorithm

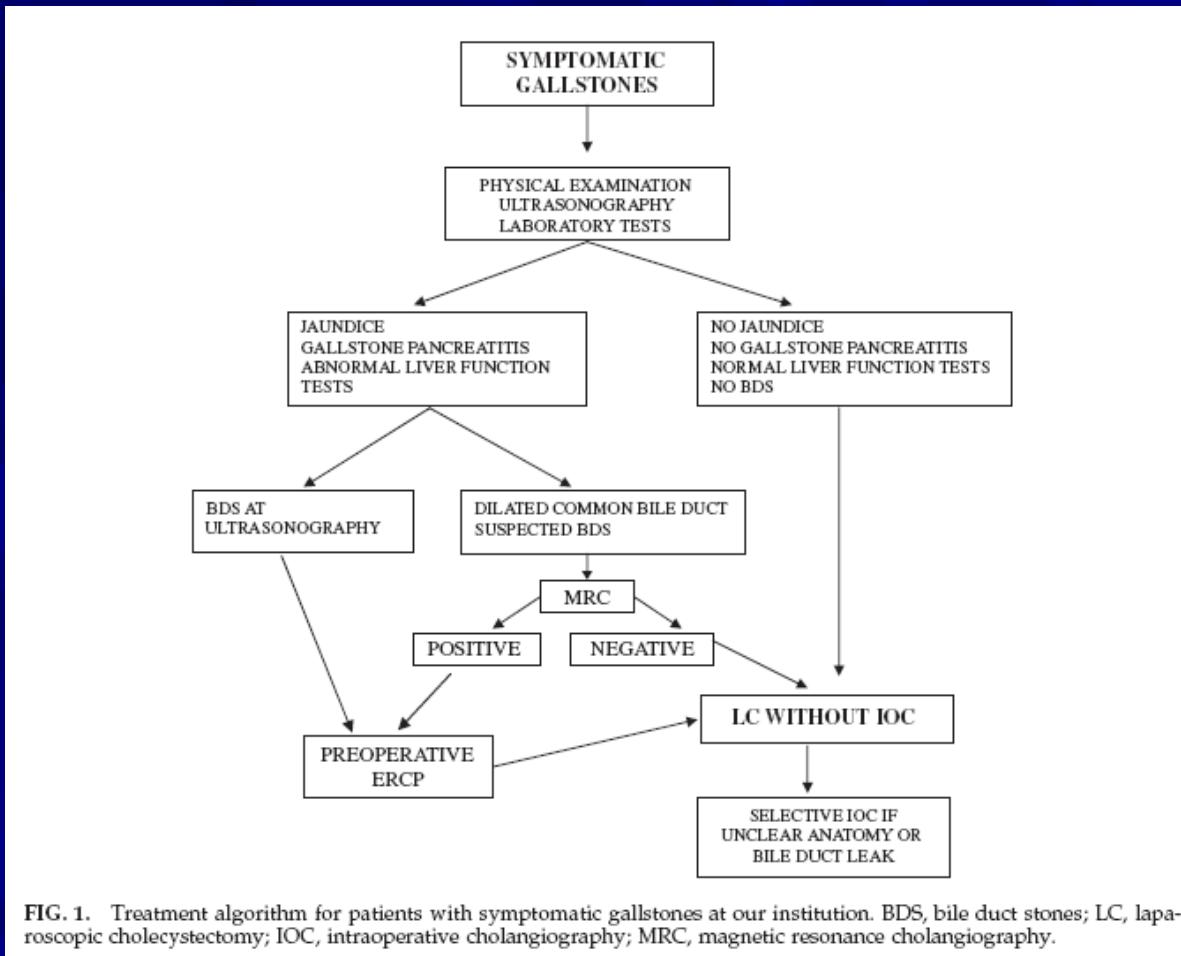


FIG. 1. Treatment algorithm for patients with symptomatic gallstones at our institution. BDS, bile duct stones; LC, laparoscopic cholecystectomy; IOC, intraoperative cholangiography; MRC, magnetic resonance cholangiography.

Fogli L, Boschi S, Patrizi P, Berta RD, Al Sahlani U, Capizzi D, Capizzi FD. Laparoscopic cholecystectomy without intraoperative cholangiography: audit of long-term results. *J Laparoendosc Adv Surg Tech A*. 2009 Apr;19(2):191-3. (Italy)

# Intraoperative Cholangiography

## ■ Summary

- Good evidence for routine IOC
- Good Evidence for selective IOC
- Good Evidence for rare IOC
- As less invasive diagnostic and therapeutic modalities become better the roll for operative interventions become less indicated.

# Intraoperative Cholangiography

- Summary
  - My Opinion...
- Routine IOC

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**THANK YOU!**



# References

- MacFadyen BV. Intraoperative cholangiography: past, present, and future. *Surg Endosc.* 2006 Apr;20 Suppl 2:S436-40. Epub 2006 Mar 23.
- Flum DR, Dellinger EP, Cheadle A, Chan L, Koepsell T. Intraoperative cholangiography and risk of common bile duct injury during cholecystectomy. *JAMA.* 2003 Apr 2;289(13)
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- Tse F, Liu L, Barkun AN, Armstrong D, Moayyedi P. EUS: a meta-analysis of test performance in suspected choledocholithiasis. *Gastrointest Endosc.* 2008;67(2):235.
- Ledro-Cano D. Suspected choledocholithiasis: endoscopic ultrasound or magnetic resonance cholangio-pancreatography? A systematic review. *Eur J Gastroenterol Hepatol* 2007; 19:1007
- Zidi SH, Prat F, Le Guen O, Rondeau Y, Rocher L, Fritsch J, Choury AD, Pelletier G. Use of magnetic resonance cholangiography in the diagnosis of choledocholithiasis: prospective comparison with a reference imaging method *Gut.* 1999;44(1):118.
- Fogli L, Boschi S, Patrizi P, Berta RD, Al Sahlani U, Capizzi D, Capizzi FD. Laparoscopic cholecystectomy without intraoperative cholangiography: audit of long-term results. *J Laparoendosc Adv Surg Tech A.* 2009 Apr;19(2):191-3.