

Laparoscopic US as a good alternative to intraoperative cholangiography (IOC) during laparoscopic cholecystectomy: results of prospective study.

- 685 IOC (-35 cannot cannulate cystic duct) , 269 LUS (-2 steatosis)
- IOC detected 4.5% CBDS; LUS 6%
- IOC sensitivity 96.9%, specificity 99.2%
- LUS sensitivity 100%, specificity 99.6%
- Results:
 - In this prospective study, LUS has been certainly as effective as IOC as a primary imaging technique for bile duct.
 - It permitted to detect CBDS with a high specificity and sensitivity, and was not followed by an increase in CBDI.



Assessment of CBD using laparoscopic US during laparoscopic cholecystectomy

- 115 consecutive patients, LUS successful in 112.
- Low risk 7%; Intermediate 36.4%; High risk 78.9%.

With increasing experience, LUS can become the routine method for evaluating the bile duct during

LC. A more aggressive preoperative evaluation of CBD is mandated in the intermediate and high risk groups of patients suspected of having CBD stones.




Intraoperative cholangiography in combination with laparoscopic ultrasonography for the detection of occult choledocholithiasis

- 103 patients IOC+LUS. Physicians team blinded.
- Success rate : IOC 91.3%; LUS 100%
- Time required for LUS was shorter.
- The sensitivity of IOC combined with LUS was 92.9% which was greater than of IOC and LUS taken separately.
- LUS is usually performed in case where IOC has failed or is contraindicated.
- The combination of both methods maximizes intraoperative detection of occult CBD stones and should at least be recommended as two complementary methods.



Indocyanine Green (ICG) Injection:

- ▶ **Shows the confluence between right and left hepatic ducts during hepatectomy Enables identification of the cystic duct and CBD from before dissection of Calot's triangle during cholecystectomy**
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Indocyanine Green Injection (ICG)

Advantages

- No need for dissection of Calot's triangle
- No need for insertion of trans-cystic tube
- No exposure to radiation
- No space-occupying C-arm machine required
- Simple and convenient procedure
- Allergic reactions

Intra-operative Decision Making

- Convert to open?
- Laparoscopic transcystic common bile duct exploration?
- Laparoscopic cholecholethotomy?
- Defer to post-op management?
- Open or laparoscopic biliary bypass?
- Transduodenal papillotomy?
- Combined laparoscopy + ERCP?

Factors influencing approach to the common bile duct

Factor	Transcystic	Choledochotomy
One stone	+	+
Multiple stones	+	+
Stones < 6mm	+	+
Stones > 6mm	-	+
Intra-hepatic stones	-	+
Cystic duct < 4mm	-	+
Cystic duct > 4mm	+	+
CBD < 6mm	+	-
CBD > 6mm	+	+
CD entrance: lateral	+	+
Entrance: posterior	-	+
Entrance: distal	-	+
Mildly inflamed	+	+
Markedly inflamed	+	-
Suturing: poor	+	-
Suturing: good	+	+

Laparoscopic CBD Exploration

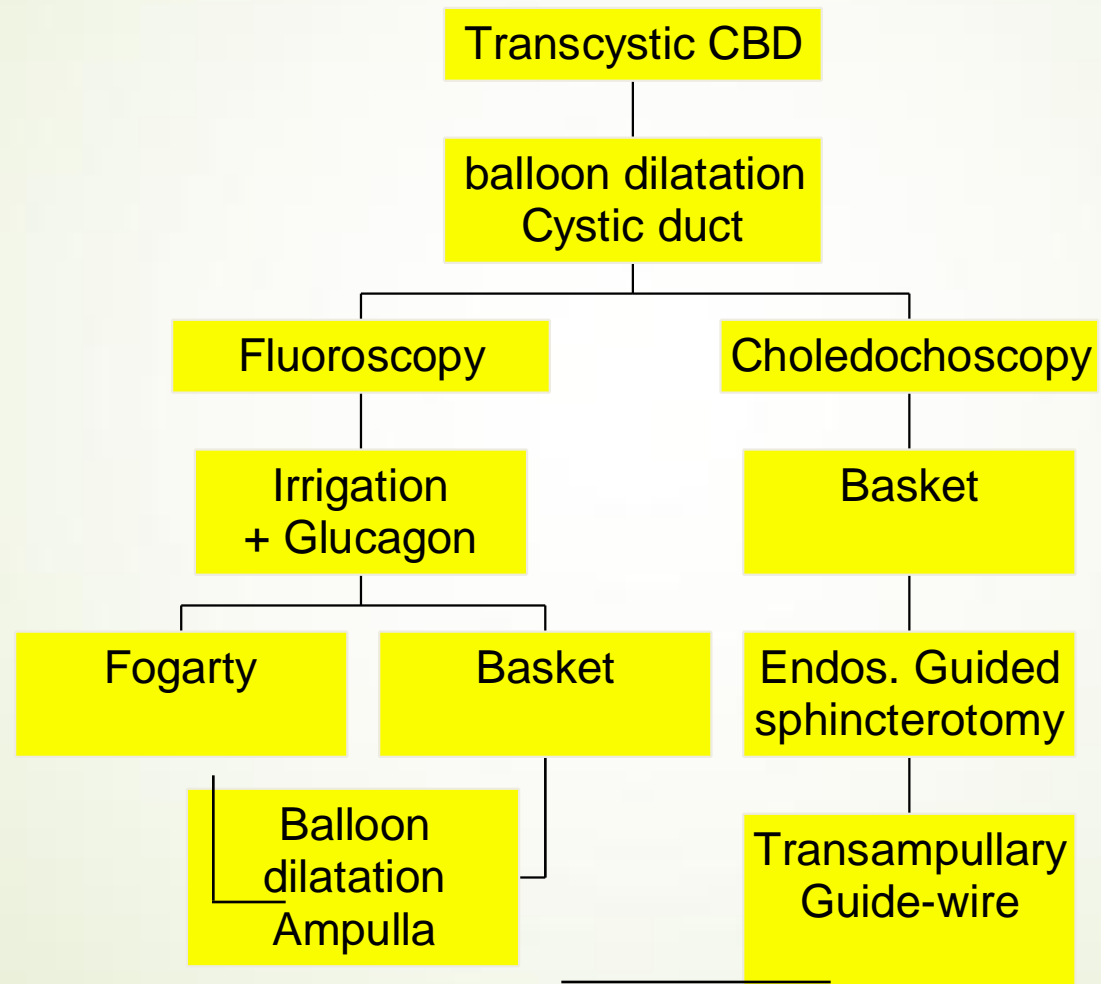
Transcystic:

- Stone < 6 mm
- Cystic duct > 4 mm
- CBD < 6 mm
- Lateral entrance of cystic duct
- Severe or mild inflammation
- Poor suturing ability

Transductal:

- Stone > 6 mm
- Cystic duct < 4 mm
- CBD > 6 mm
- Posterior or distal entrance of cystic duct
- Mild inflammation
- Good suturing ability

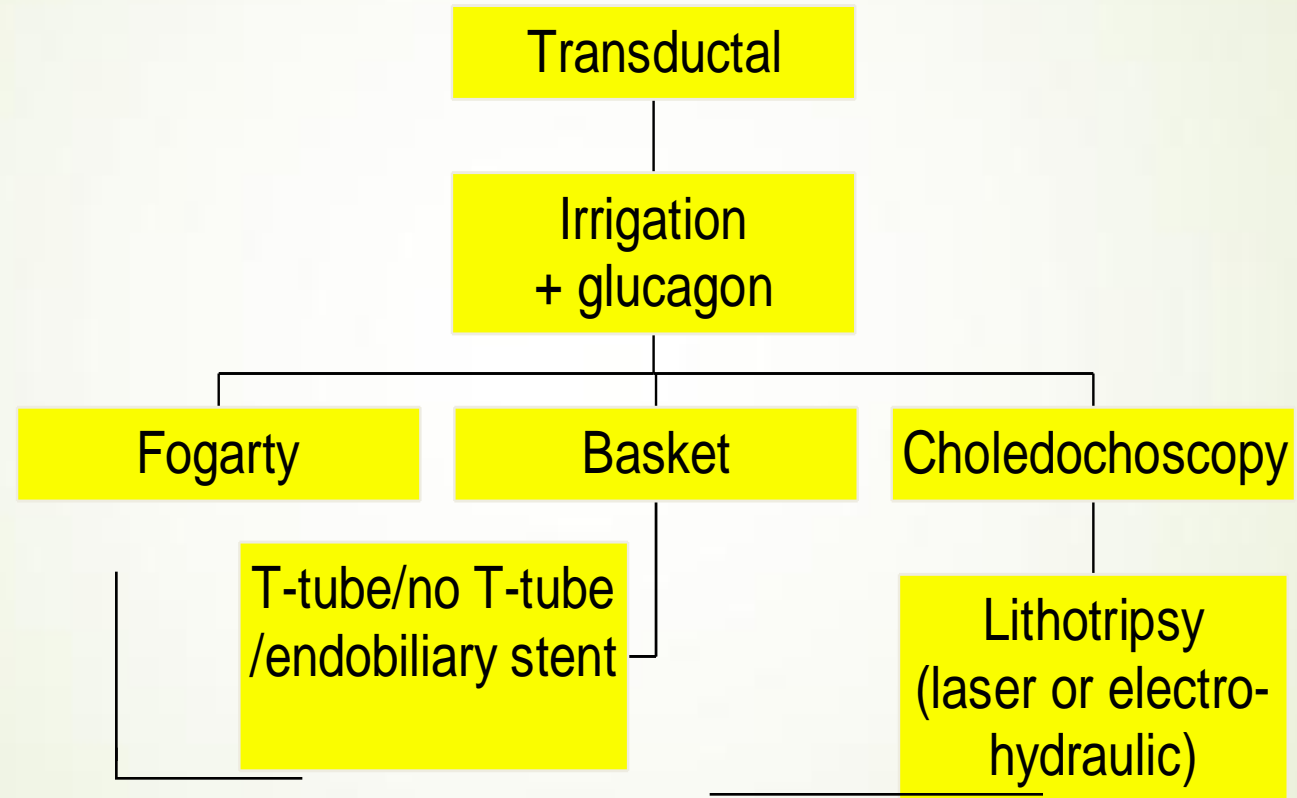
Transcystic Approach



Transcystic Approach

STUDY	N	SUCCESS (%)
FERZLI, 1991	13	100
SAGES, 1994	187	95
PHILLIPS, 1994	111	91
DePAULA, 1994	102	84
BERTHOU, 1994	78	67
McGRATH, 1994	44	93
DION, 1994	18	94
STOKER, 1995	33	94

Laparoscopic Choledochotomy



Laparoscopic Choledochotomy

Study	Total patients	Success (%)
Berthou 94	75	96
Franklin 94	60	96
Dion 94	41	93
SAGES 94	39	81
Stoker 95	27	94
DePaula 94	12	100
Ferzli 91	11	100
Phillips 95	3	100
McGrath 94	1	100

Complications of Lap. CBD Exploration

Study	Patients	Retained stone	Morb.	Mort.	Length of stay
SAGES	226	2.6	5.7	0.4	?
Berthou	153	1.3	9.4	0	?
Phillips	114	3.6	17.1	0.9	3.7
DePaula	114	0.9	6.2	0.9	1.7
Petelin	77	1.5	10.4	0.8	1.9
Franklin	60	0	3.3	1.6	2.1
Stoker	60	5	10	0	2.7
Dion	59	5	25	0	12
McGrath	45	2.2	26.7	0	?
Ferzli	24	8.3	29.1	0	2.7

Techniques

Irrigation:

- Transcystic flushing
- IV glucagon
- Fluoroscopic monitoring

Balloon:

- 4 Fr Fogarty balloon combined with choledochoscope

Basket:

Avoid capture of papilla of Vater

Choledocoscopy / completion cholangiogram

- Primary closure of CDB vs T-tube placement





Combined Laparoscopy and ERCP

- 45 pts underwent lap chole w/ intra-op cholangiogram
- 33 pts had succesful intra-op ERCP with extraction of CBD stones
- No post-op complications related to procedure (i.e. pancreatitis bleeding, perforation)
- Mean hospital stay: 2.55 ± 0.89 days
- No pts w/ signs or symptoms of retained CBD stones during mean post-op follow-up of 9 ± 4.07 months

Current Trends

National Hospital Discharge Survey database 1979 to 2001:

- ▶ Frequency of ERCP vs CBDE
- ▶ Beginning of study: 47,000 CBDE's per year
- ▶ End of study: 7,000 CBDE vs 43,000 ERCP
- ▶ Complication rates from CBDE
 - ✓ 3.4% at beginning of study
 - ✓ 17.4 at end of study

“ERCP has replaced the need for most but not all CBDE”

“Both choledocholithiasis treatment algorithms and clinical training paradigms need to account for the rarity of CBDE and high complication rates associated with it, by incorporation of training modules in surgical residencies and advocating referral to centers having expertise in biliary tract operations from surgeons with little CBDE experience”

Drainage Procedures

Indications:


- Multiple CBD stones
- Recurrent choledocholithiasis
- Unsuccessful sphincterotomy
- Impacted large CBD stones
- Markedly dilated CBD

Choices:

- Choledochoduodenostomy
- Transduodenal sphincteroplasty
- Choledochojejunostomy

Postoperative Management

- Post-op ERCP
- Lithotripsy
 - ✓ Mechanical (crushing technique)
 - ✓ Extra-corporeal shock wave (electromagnetic)
 - ✓ Intra-corporeal (laser)
- Percutaneous radiologic
- Dissolution (chemical infusion)
 - ✓ Mono-octanoin
 - ✓ Methyl *tert*-buthyl ether (MBTE)
- Ursodeoxycolic acid
 - ✓ Prevention



Treatment of difficult bile duct stones: a particularly safe option for octogenarians


- Ten years (1995-2006) : 44 patients median age 80.
- Success in 34 (77%).
- The others required multiple attempts. All but one achieved complete clearance.
- Peroral endoscopic electrohydrolic lithotripsy(EHL) or laser lithotripsy (ILL), under direct cholangioscopic visualisation, is an effective treatment for difficult CBD stones.
- The technique can be used safely even in frail and elderly patients.
- The vast majority of patients may be expected to remain symptom-free for a prolonged period.



Extracorporeal shock wave lithotripsy: analysis of factors that favor stone fragmentation

283 patients with large CBDS were subjected to ESWL . CBDS were fragmented to 5mm or less then extracted via ERCP.
Complete clearance achieved in 239 patients(84.4%),partial in 35 (12.3%)

A high success rate, negligible complications and non-invasive nature of the procedure make ESWL a useful tool for removing large CBD stones



Risk factors for recurrent bile duct stones after endoscopic clearance of CBD stones

114 patients (2004-2007) S/P ERCP.

The recurrence of CBD stones was more commonly found in the patients group with type 1 periampullary diverticulum and multiple sessions of ERCP.

Therefore, patients with these risk factors should be on regular follow up.

Baek YH et al Risk factors for recurrent bile duct stones after endoscopic clearance of common bile duct stones *Korean J Gastroenterol.* 2009 Jul Korea.

Conclusion

- Multidisciplinary approach to CBD stones
- Pre-operative identification based on risk factors
- Laparoscopic CBD exploration is safe, cost-effective and carries low morbidity and mortality rate
- Surgeon experience determines:
 - ✓ Lap vs Open approach
 - ✓ Type of drainage procedure if necessary

LAP. CHOLE + CBD STONE





THANK YOU