BGES- Warm-up Package 2011

Laparoscopic Cholecystectomy

By Valerio Lucidi (ULB) & Benoit Navez (UCL)
**Warm-up : 3 & 4**
- Cholecystectomy by laparoscopic approach
- Technical tricks...
- Preoperative work-up
- Peroperative cholangiography
- Management of CBD stone
- How to prevent BTI
- Acute cholecystitis, acute pancreatitis,...
- *Electrosurgery, Appendectomy, Inguinal repair, ventral repair, Reflux surgery, gastric ulcer, Emergencies*...

**Starters Package : 5 & 6**
- How to manage a biliary tract injury...
- *Liver, pancreatic, Bariatric surgery, Colic, vascular surgery*
Laparoscopic Cholecystectomy

How many did you perform (first hand)?

1. 0
2. 1 - 5
3. 6 - 10
4. 11 – 20
5. > 20
Open Cholecystectomy
How many did you perform (first hand)?

1. 0
2. 1 - 5
3. 6 - 10
4. 11 – 20
5. > 20
Cholecystectomy: What indications?

All patients with lithiasis have to be operated because they will become symptomatic

1. YES

2. NO
Cholecystectomy: What indications?

All patients with lithiasis have to be operated because they will become symptomatic

NO !!!

• 80% will remain asymptomatic all life long
• Annual incidence of « biliary pain » or complication = 1-2%
  ✓ in 20 year evolution: 20% of pain & 5% complications
• Systematic cholecystectomy = Morbidity + Mortality + Price
Lithiasis: What natural evolution?

Vesicular Lithiasis (M=8% F=17%)

Cystic duct Obstructio → Asymptomatic 80%

CBD Obstructio

Biliary pain

Chronic cholecystitis

Acute cholecystitis

Obstructive jaundice

Angiocholitis

Pancreatitis
Cholecystectomy: What indications?

What means «Symptomatic»?

Biliary pain:

• Begins **fast**: gets to max intensity in <1h
• 70% **epigastric** & 25% RUQ pain
• Often **irradiates**: right scapula, shoulder, back
• Often **post-prandial**
• Lasts 15min to many **hours** usually <5h
• **Agitation** & Search for antalgic position
• **Nausea** & Vomiting in 2/3 pts
• **Stops progressively** (but sometimes rapidly)

...... Cholecystitis, Pancreatitis, Angiocholitis, CBDS
**Cholecystectomy: What indications?**

**Differential Diagnosis**

- Gastric or Duodenal Ulcer Perforation
- Acute pancreatitis
- Myocardial Infarction
- Right inferior acute pneumonia
- Acute appendicitis
- Fitz-Hugh Curtis Syndrome (Chlamidia Trachomatis or gonococcus)
- ...
Laparoscopy is the golden standard
... Laparotomy for difficult cases ...
Laparoscopic Cholecystectomy: What contraindications?

- Gallbladder Carcinoma
- Septic shock (e.g. cholangitis)
- Severe acute pancreatitis

- Cirrhosis with portal hypertension
- Coagulopathy
- (Pregnancy)
- Severe cardiorespiratory insufficiency

SAGES guidelines
Surg Endosc 2000, 14:771-772
Laparoscopic Cholecystectomy: What to know before starting?

- Know ANATOMY & all possible variations!!!
Représentation anatomique du triangle de Calot limité par le bord inférieur du foie en haut, la voie biliaire principale en dedans et le canal cystique en bas et en dehors.
Variables anatomiques du canal cystique avec leur fréquence respective.

a, b, c: Variations les plus courantes d'implantation du canal cystique.

d, e, f: Anomalies rares d'implantation du canal cystique.
Liver arteries

JF. Gigot & B. Navez: Chirurgie des Voies Biliaires; Ed Masson 2005
Laparoscopic Cholecystectomy: ...START ...
Laparoscopic Cholecystectomy: Trocar positioning

How many? 4 ...3 ...2 ...1

Laparoscopic Cholecystectomy

Courtesy of B. Navez
Laparoscopic Cholecystectomy: Trocar positioning

Obese patient

Difficult cases

Optional (rare)
Laparoscopic Cholecystectomy: Where to begin the dissection?

- Begin with an anatomical dissection and exposure of Calot triangle

Only 2 structures have to be isolated. If more = problem!

JF. Gigot & B. Navez: Chirurgie des Voies Biliaires; Ed Masson 2005
Exposure of Calot's triangle

- Lateral and inferior retraction of Hartman's pouch
- Lifting up liver or pulling down duodenum with retractor
- Optional: round ligament traction

Courtesy of B. Navez & JF. Gigot
Go on with the dissection...

- Open posterior peritoneal sheet as far as possible up to the gallbladder
- Open anterior peritoneal sheet
- Stay always close to the gallbladder...
- Be careful with electrocautery use ... to avoid thermal injury
Calot dissected: STOP & Think!

NO clip NEITHER cutting before perfect identification !!!
Laparoscopic Cholecystectomy: Need for Cholangiography?

When do you do a IOC?

1. Never
2. Always
3. Only when doubt
Laparoscopic Cholecystectomy: IOC = prevention of BDI?
Intraoperative Cholangiography and Risk of Common Bile Duct Injury During Cholecystectomy

01-92 → 12-99 USA
- 1.570.361 Chol/L
- BDI with IOC (0.39%)
- BDI without IOC (0.58%)
- Statistically significant
- Relative risk 1.49 (1.71)

Figure. Frequency of Use of Intraoperative Cholangiography (IOC) by Surgeons and the Rate of Common Bile Duct Injury (CBD)

Flum DR JAMA 2003;289:1639
Bile Duct Injury During Cholecystectomy and Survival in Medicare Beneficiaries

David R. Flum, MD, MPH
Allen Cheadle, PhD

Context: Common bile duct (CBD) injury during cholecystectomy is a significant source of patient morbidity, but its impact on survival is unclear.

Hazard ratio (HR) for death during the follow-up period was significantly higher (2.79; 95% confidence interval [CI]: 2.71-2.88) for patients with a CBD injury than those with no injury.

All Association's (AMA's) Physician Masterfile. Records with a cholecystectomy were reviewed and those with an additional procedure were excluded. The entire population had a mean (SD) 37.7 years; 56.3% were women. Thirty-three percent of all patients died within the 9.2-year survival, 5.6 years; interquartile range: 3.2-7.4 years), with 19.5% with a CBD injury remained alive. The adjusted hazard during the follow-up period was significantly higher (2.79; 95% CI: 2.71-2.88) for patients with a CBD injury than those without.

Flum DR JAMA 2003;290:2173
The most common mechanism of BDI is confusion between CD & CBD. IOC (and diagnosing BDI) will prevent worsening of a lateral injury to a complete transsection or excision.

« classic injury » : 43 %

Laparoscopic Cholecystectomy: Need for Cholangiography?

Courtesy of B.Navez & JF.Gigot
Laparoscopic Cholecystectomy: Need for Cholangiography?

• IOC offers opportunity to prevent error …
• Helps to lower the gravity of BDI
• Diagnoses CBDS!
• … Medico-legal help in case of trouble

• Risk of IOC?
  – 1 case anaphylactoid reaction after IOC
    (Moskovitch, Surg Endosc, 2001)
  – Systemic shock after non-vascular iodure injection is very rare
  – NB: need to know biliary anatomy to read a Cholangiogram!!
Laparoscopic Cholecystectomy: The End ... of procedure

- Irrigate and aspirate operative field
- Control hemostasis
- Drain?
  - Only if bleeding or biliary “trouble”
  - Always in case of ANY doubt!!!
  - Removed on postoperative day 1 or 2 (…if no bile!)
- Trocars removal on view control
- Closure of scars (10 mm)
Risks factors for Bile Duct Injury

- Learning curve
- Thermal injury because of faulty instruments
- Disease severity
- Difficult or rare anatomy
- Chronic inflammation, dense scarring, fat in portal area
- Peroperative bleeding
- No IOC …
« No surgeon is immune from the risk of bile duct injury, and no case is simply routine »

Calot’s triangle dissection
Clipping
I.O.C.
Gallbladder bed
Endocystic stones
WIDE CYSTIC DUCT

Running suture
Accessory bile duct

Incidence: 0.5 - 4.6%
Postop leakage: 0.15%
Dangerous vascular anatomy
Large cystic artery or Right hepatic artery?
Dangerous biliary anatomy
Dangerous Chronic cholecystitis
During your first 100 LC,
select « easy » cases
!!!
CONVERSION TO LAPAROTOMY
..... is often the safest option!

in « difficult » cases (acute or chronic inflammation)
  - when poor visualization or exposure
  - when severe inflammation obscures the anatomy within Calot triangle
  - when the anatomy is confusing
  - when excessive bleeding or use of electrocautery

if questionable bile duct injury
  - on IOC
  - continuous and unexplained leakage of bile during operation
  - on surgical dissection

Not a failure, but the sign of a sound surgical judgement!
Single-incision laparoscopic cholecystectomy: is it more than a challenge?

Simon Erkin · Omer Fink · Meital Seldin

Received: 27 December 2006 / Accepted: 25 April 2009 © Springer Science+Business Media, LLC 2009

Abstract Background Single-incision laparoscopic surgery (SILS) is a promising technique with regard to reducing postoperative pain, decreasing complications, and improving cosmesis. The technique was the access point of entry to the abdomen for all the patients. Results 888 of 993 patients underwent cholecystectomy via SILS. The technique was the access point of entry to the abdomen for all the patients. Conclusion The rate of SILS for cholecystectomy is safe and feasible with reasonable incision size.

Single-port access in laparoscopic cholecystectomy

Thomas E. Langenfeld · Thomas Nimminger · Mehmet Bock

Methods Patients underwent laparoscopic cholecystectomy using the ASC TriPort. In all cases, a small transumbilical incision was used to insert two 5-mm rigid laparoscopic instruments and a 5-mm 3D telescope via the TriPort. Hemostasis control was obtained using an ultrasonic cutting device (Echobase, Olympus). Endo Clips (Ethicon Endo-Surgery) were used to secure the ligation of the cystic artery and duct. All cases were performed by a single surgeon.

Abstract Background Laparoscopic techniques have allowed surgeons to perform complicated intrabdominal surgery with minimal trauma. Recent innovations have pioneered the use of single-incision laparoscopic surgery (SILS), which has the potential of further reducing the trauma of surgical access. This may lead to reduced postoperative pain and improved patient outcomes.

Methods This article reports the authors' method of performing SILS cholecystectomy, carefully placed sutures used to support the gallbladder and dissection continues outside the umbilicus. Although initial reports of success with a new technique, no consensus on the optimal technique for this method.
Patient Selection for SPAS Cholecystectomy

Ideal “Early Experience” Patient

- BMI < 30
- No prior surgery and no significant co-morbidities
- Biliary colics only, no cholecystitis
- Elective surgery
- No choledocholithiasis
SPAS Potential Benefits*

*Proposed & Theoretical – Not Clinical Proven

- Reduced postoperative pain, Decreased use of narcotics
- Lower morbidity
- Faster recovery time (i.e. earlier return to normal work)
- Possible lower cost due to shorter hospital stay
- Cosmetic, Psychological
- Fewer wound complications
- Reduced trocars equals less site herniation and infection
- Ability to rapidly convert SILS to conventional laparoscopic procedure
Cosmetic benefit ?
Single Port Surgery: Risks & Challenges

- Increased wound complications & incisional hernia
- Increased perioperative morbidity
- Triangulation/Crossing/Clashing of Instruments
- Need of New Instrumentation (multi-lumen ports, articulating/flexible instrumentation)
- Altered Ergonomics
- Prolonged operative time
- Learning Curve Issues
- Theatre staff education
- Additional cost
What is the Single Port Technique?

240 €

300 €
Laparoscopic Cholecystectomy: What attitude in special situations

- Common Bile Duct Stones (CBDS)
- Acute Cholecystitis
- Cirrhosis
Laparoscopic Cholecystectomy: What to do in case of CBDS?

Pre-operative diagnosis of CBDS:

1. Laparoscopic cholecyst + CBD-exploration ?
2. MRCP and early LC ?
3. MRCP + ERCP followed by early LC ?
4. early LC followed by post-op ERCP ?
Prevalence of CBDS = 12% (5-20%)

- Biology (Bilirubin & AlkP) or diam CBD
  - Se<70% Sp<50%
- **US**: Se<60%
- **MRCP & IOC**: Se=85% Sp=91%
- **EUS**: Se=92% Sp=100%
Médico-surgical Management ...

Risk BT stone preop

**YES**
- Cholécystectomy + IOC

**NO**
- Cholécystectomy + IOC
- No stone
- BT stone(s)

- BT < 8 mm
  - ERCP postop
  - Perop?
  - Transcystic KT

- BT > 8 mm
  - Transcystic removal

Failure: ERCP (KT TC)

Spontaneous Elimination!
**Laparoscopic Cholecystectomy: What to do in case of CBDS?**

**Per-operative diagnosis of CBDS:**

1. Laparoscopic cholecyst + CBD-exploration ?
2. Leave CBDS & post-op ERCP ?
3. Depends on size of CBD ?
Remaining formal indications of surgical approach in CBDS

- Failures of ERCP/ES
- History of Roux-en-Y gastrectomy / bypass
- Mirizzi Syndrome
- (rare) indications of choledoco-duodenostomy or choledoco-jejunostomy
- ...
Limiting Factors for Successful Lap CBDE

• **Learning curve in CBDE:** handling scopes, suturing ...

• **Severe inflammatory process**

• **Previous upper GI tract surgery (gastrectomy ...)**

• **Intra-hepatic stones / multiple CBD stones (> 5)**

• **Impacted (papillary) stones**
Peroperative Detection of CBDS

- **Intra-Operative Cholangiography (IOC)**
  - Detection of 95% CBDS
  - Biliary anomaly
  - Bile Duct Injury

- **Flexible Choledoscopy**
OPERATIVE STRATEGY

Intraoperative Cholangiography

Stones: number, size, location
Cystic duct: diameter, implantation
CBD: diameter, inflammation

Transcystic approach

Choledocotomy

Conversion to open surgery
Postop ES
Instrumentation

- **Stone extraction**: under endoscopic/fluoroscopic control
  - *Dormia basket*, atraumatic
  - *Fogarty balloon*
  - *Flush*
- **Clearance assessment**
Transcystic Approach

**Indications**

- **Stones**: *small size*  
  *limited number*  
  <= 5  
  *below cystic duct-CBD junction*

- **Cystic duct**: short, dilated  
  and right implantation
Transcystic Approach

Recommendations

- Avoid dilatation of cystic duct (rupture !)
- Use Dormia basket with flexible tip
- When obstructive valves, avoid repeated instrumentation
- Stone extraction under fluoroscopic or choledocoscopic control
- Stone clearance assessment at the end of the procedure:
  * IOC
  * Choledocoscopy (upper biliary tract in only 15 %)
Choledocotomy

**Indications**

- **Stones**
  - * large size
  - * multiple

- **Cystic duct**
  - * non dilated
  - * low implantation

- **Common Bile Duct**
  - * diameter > 7 mm
Male patient 46 yrs

- residual CBD stone after ERCP/ES
- choledocotomy, stone extraction, cholecystectomy
Choledocotomy

**CBD suture**
- Primary suture

**Biliary drainage**
- T-Tube
- Transcystic drain
Limiting Factors for Successful Lap CBDE

Technical skills for LCBDE

• stone retrieval
• handling cholangioscopes/ Dormia
• knotting and suturing CBD
Biliary Drainage

• **No biliary drain** : subhepatic silicone drain (2 days)

• **Biliary drain** : removal after 21 days

**Advantages**
* Decompression of the biliary tract
* Cholangiographic control

**Drawbacks**
* Increased morbidity:
  - drain pulled out or ruptured
  - cholangitis, wound infection
  - biliary fistula after removal
* Longer hospital stay
CONCLUSION

  - Successful in 90-95% of cases
  - Low morbidity rate (<10%)
  - Impacted stones are the main causes of failure
  - Specific indications for transcystic way and choledocotomy
  - Choledochoscopy and IOC after stone extraction lower the rate of residual stones
- Requires expertise and material (choledocoscope)
BILIARY PANCREATITIS

• All patients require imaging of the bile duct (MRCP or EUS)

• ES (or duct drainage by stenting)
  – if cholangitis (RcGr A)
  – If jaundice or dilated CBD
  – If severe pancreatitis | Rc Gr B and C

• Timing of Lap Cholecystectomy (LC) with I.O.C.
  – Mild pancreatitis : LC preferable during the same admission
    (should not be delayed more than 2 weeks after discharge)
  – Severe pancreatitis : LC when signs of lung injury and systemic
    disturbance have resolved

Do not lose stones in the abdomen!

Risk of complication if I lose a stone...

- 18.280 lap chol
- Gallbladder perforation: 18.3%
- Gallstone spillage: 7.3%
- Risk of complication: 7%

→ So Complications due to spilt stone: 2 / 1000 P
Acute Cholecystitis (AC) Definition & Pathophysiology

• Acute inflammatory disease of the gallbladder usually attributable to gallstones,

  – Physical obstruction of the gallbladder by a gallstone, at the neck or in the cystic duct
  – Increased pressure in the gallbladder
  – Bile stasis
  – Thickening of bile
  – Initially non-infectious inflammation
  – Secondary bacterial infection of bile
  – Inflammation of gallbladder’s wall ...
Diagnosis of AC

• **Clinical symptoms of AC**
  – Abdominal pain (RUQ) + Nausea + Vomiting + Fever

• **Blood tests**
  – NO specific blood test for AC!
  – WBC + CRP + LFT’s + Amylase + BUN Creat + PT

• **Diagnostic imaging**
  – Enlarged gallbladder > 50mm
  – thickened GB wall > 4mm
  – GB stones
  – US-Murphy’s sign (specificity >90%)
Acute Cholecystitis Imaging:
Standard method = US

Clinical setting
PPV 95%
NPV 98%
Acute Cholecystitis Imaging:
CT or MRI + MRCP
Acute Cholecystitis (AC)
What do you do?

1. Medical treatment first & LC after 6 weeks?
2. Urgent LC < 48h
3. Urgent LC < 4 days
4. Urgent LC < 1 week
Recurrence of AC after conservative treatment

• Recurrence waiting for cholecystectomy
  – 2,5% - 22%
    • 6% with gallbladder perforation!

• Long-term recurrence
  – 10% - 50% > 6 month
Acute Cholecystitis (AC)
When do you operate?
Early vs Delayed LapChole for AC: Operative time

<table>
<thead>
<tr>
<th>Citation</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lo et al, 1998</td>
<td>.022</td>
</tr>
<tr>
<td>Kolla et al, 2004</td>
<td>.433</td>
</tr>
</tbody>
</table>

Fixed Combined (3) .002
Random Combined (3) .002

Early vs Delayed LapChole for AC: Conversion rates

Citation                  P Value
Lo et al, 1998            .174
Lai et al, 1998           .919
Johansson et al, 2003     .701
Kolla et al, 2004         1.000
Fixed Combined (4)        .718
Random Combined (4)       .736

Early LC                  Delayed LC
44/192 (22.9%)             45/176 (25.6%)

Early vs Delayed LapChole for AC: Complication rates

#### Citation vs PValue

<table>
<thead>
<tr>
<th>Citation</th>
<th>PValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lo et al, 1998</td>
<td>.070</td>
</tr>
<tr>
<td>Johansson et al, 2003</td>
<td>.178</td>
</tr>
<tr>
<td>Kolla et al, 2004</td>
<td>.677</td>
</tr>
</tbody>
</table>

#### Combined (4)

<table>
<thead>
<tr>
<th>Random</th>
<th>PValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed</td>
<td>.813</td>
</tr>
<tr>
<td>Combined (4)</td>
<td>.829</td>
</tr>
</tbody>
</table>

---

Early vs Delayed LapChole for AC: Bile Duct Injury rates

<table>
<thead>
<tr>
<th>Reference</th>
<th>Bile duct injury</th>
<th>Weight (%)</th>
<th>Risk ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dávila et al.</td>
<td>0 of 27, 1 of 36</td>
<td>26.9</td>
<td>0.44 (0.02, 10.41)</td>
</tr>
<tr>
<td>Johansson et al.</td>
<td>0 of 74, 1 of 71</td>
<td>31.8</td>
<td>0.32 (0.01, 7.73)</td>
</tr>
<tr>
<td>Koilla et al.</td>
<td>1 of 20, 0 of 20</td>
<td>10.4</td>
<td>3.00 (0.13, 69.52)</td>
</tr>
<tr>
<td>Lai et al.</td>
<td>0 of 53, 0 of 51</td>
<td>Not estimable</td>
<td></td>
</tr>
<tr>
<td>Lo et al.</td>
<td>0 of 49, 1 of 50</td>
<td>30.9</td>
<td>0.34 (0.01, 8.15)</td>
</tr>
<tr>
<td>Total</td>
<td>1 of 223, 3 of 228</td>
<td>100.0</td>
<td>0.64 (0.15, 2.65)</td>
</tr>
</tbody>
</table>

Heterogeneity: $\chi^2 = 1.32, P = 0.02, I^2 = 0\%$

Test for overall effect: $Z = 0.68, P = 0.54$
### Bile Duct Injury: Risk Factors

<table>
<thead>
<tr>
<th>Period</th>
<th>Patients</th>
<th>Type of Procedure</th>
<th>Clinical Presentation</th>
<th>BDI Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vereecken 1992</td>
<td>3244</td>
<td>LC</td>
<td>all type</td>
<td>0.50 %</td>
</tr>
<tr>
<td>Gigot &lt; 1997</td>
<td>9959</td>
<td>LC</td>
<td>all type</td>
<td>0.50 %</td>
</tr>
<tr>
<td>Vandesande 1997</td>
<td>10.595</td>
<td>LC</td>
<td>all type</td>
<td>0.37 %</td>
</tr>
<tr>
<td>Vandesande 1997</td>
<td>11.628</td>
<td>all type</td>
<td>all type</td>
<td>0.58 %</td>
</tr>
<tr>
<td>Vandesande 2000</td>
<td>14.715</td>
<td>LC</td>
<td>all type</td>
<td>0.31 %</td>
</tr>
<tr>
<td>Vandesande 2000</td>
<td>16.915</td>
<td>all type</td>
<td>all type</td>
<td>0.54 %</td>
</tr>
<tr>
<td>Navez 2011</td>
<td>1089</td>
<td>LC</td>
<td>acute cholecystitis</td>
<td>1.2 %</td>
</tr>
</tbody>
</table>

3. **Local Conditions:**
   1. Inflammation ... x 2 !!

4. Surgeons Experience (+/-)

*Navez B 2011 in press*
Early vs Delayed LapChole for AC: Length Hospital stay

<table>
<thead>
<tr>
<th>Citation</th>
<th>P Value</th>
<th>Early LC</th>
<th>Delayed LC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kolla et al, 2004</td>
<td>0.023</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lai et al, 1998</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo et al, 1998</td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed</td>
<td>Combined (3)</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Random</td>
<td>Combined (3)</td>
<td>.000</td>
<td></td>
</tr>
</tbody>
</table>

7.6 (4 – 21 days)  11.6 (5 – 24 days)

ACUTE CHOLECYSTITIS
Laparoscopic Surgery early vs delayed
Randomised Trials Summary

• Total LOS shorter in early operation

• No Difference
  - conversion
  - morbidity
  - bile duct damage (Bile leak rate higher in early)

• Operative Time longer in early operation
## AC Management: The reality

National English database: 25743 pts admitted for AC in 2003-2004

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Treated at first admission</th>
<th>Treated at readmission</th>
<th>Treated at elective admission</th>
<th>$\chi^2$</th>
<th>d.f.</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholecystectomy</td>
<td>3791</td>
<td>1028</td>
<td>9606</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attempted laparoscopic cholecystectomy</td>
<td>2663 (70-2)</td>
<td>709 (69-0)</td>
<td>8698 (88-7)</td>
<td>78.52</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Converted to open cholecystectomy</td>
<td>284 (10-7)</td>
<td>103 (14-5)</td>
<td>722 (8-3)</td>
<td>39.39</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Open cholecystectomy</td>
<td>1128 (29-8)</td>
<td>319 (31-0)</td>
<td>1108 (11-3)</td>
<td>78.52</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Deaths</td>
<td>62 (1-6)</td>
<td>7 (0-7)</td>
<td>22 (0-2)</td>
<td>88.49</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mean(s.d.) age (years)*</td>
<td>53.1 (18-1)</td>
<td>49.3 (18-4)</td>
<td>52.1 (16-8)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Results

#### n

<table>
<thead>
<tr>
<th>Procedure</th>
<th>n</th>
<th>Deaths</th>
<th>Postop. stay (days)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open cholecystectomy</td>
<td>1128</td>
<td>38 (3-4)</td>
<td>6 (2-10)</td>
</tr>
<tr>
<td>Laparoscopic cholecystectomy</td>
<td>2379</td>
<td>22 (0-9)</td>
<td>2 (1-4)</td>
</tr>
<tr>
<td>Laparoscopic converted to open cholecystectomy</td>
<td>284</td>
<td>2 (0-7)</td>
<td>6 (4-9)</td>
</tr>
<tr>
<td>All cholecystectomies</td>
<td>3791</td>
<td>62 (1-6)</td>
<td>3 (2-6)</td>
</tr>
</tbody>
</table>

*Conversion=11%

*Postop. stay (days)*/

Acute Cholecystitis (AC)

When do you operate?

- When?
- Early?
  - <24h ??
  - <48h ??
  - <72 ??
  - <1w ??
- Delayed?
ACUTE VERSUS DELAYED SURGERY
Laparoscopic Surgery
Randomised Trials

• Lo et al Annals of Surgery 1998
  - 86 patients
  - early < 72 hours post admission

• Lai et al British Journal of Surgery 1998
  - 99 patients
  - early < 1 week symptoms

• Johansson et al Journal of Gastrointestinal Surgery 2003
  - 133 patients
  - surgery < 1 week symptoms
  - surgery ≤ 48 hours randomisation

• Kolla et al Surgery Endoscopic 2004
  - 40 patients
  - surgery ≤ 48 hours randomisation
Table 2. Correlation between operative delay and complication rates.

<table>
<thead>
<tr>
<th>Operative delay (first symptoms-operation)</th>
<th>≤4 days</th>
<th>&gt;4 days</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local complications</td>
<td>21/323 (6.5%)</td>
<td>30/227 (13.2%)</td>
<td>0.01</td>
</tr>
<tr>
<td>General complications</td>
<td>23/323 (7.1%)</td>
<td>18/227 (7.9%)</td>
<td>NS</td>
</tr>
<tr>
<td>Overall complications</td>
<td>43/323 (13.3%)</td>
<td>45/227 (19.8%)</td>
<td>0.04</td>
</tr>
<tr>
<td>Deaths (n)</td>
<td>1</td>
<td>3</td>
<td>NS</td>
</tr>
</tbody>
</table>

Table 3. Influence of pathological findings.

<table>
<thead>
<tr>
<th></th>
<th>Acute edema (1)</th>
<th>Empyema (2)</th>
<th>Gangrene (3)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 vs. 2</td>
</tr>
<tr>
<td>N</td>
<td>355</td>
<td>160</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>Conversion</td>
<td>38 (11%)</td>
<td>37 (23%)</td>
<td>45 (48%)</td>
<td>0.0002</td>
</tr>
<tr>
<td>Operative time (minutes)</td>
<td>111</td>
<td>127</td>
<td>117</td>
<td>0.001</td>
</tr>
<tr>
<td>Complications</td>
<td>40 (11%)</td>
<td>34 (21%)</td>
<td>17 (19%)</td>
<td>0.003</td>
</tr>
<tr>
<td>BTT</td>
<td>1 (0.28%)</td>
<td>2 (1.26%)</td>
<td>1 (1.0%)</td>
<td>NS</td>
</tr>
</tbody>
</table>
What Approach?

Laparotomy?

Laparoscopy?
ACUTE CHOLECYSTITIS
Laparoscopic Cholecystectomy
Gangrenous Cholecystitis

• Higher conversion rate
• 50 – 80% still successful LC
• Worth attempting but convert early if no progress
• Early decision for open conversion – does NOT represent failure
The “inside approach of the gallbladder” is an alternative to the classic Calot’s triangle dissection for a safe operation in severe cholecystitis

Catherine Hubert · Laurence Annet · Bernard E. van Beers · Jean-François Gigot  

39/552 pt (7%)  
Indication:  
• Severe acute or chronic inflammation  
• Coexistent Anomalous Right Hepatic Duct  
• Mirizzi syndrome  
Purpose:  
• Prevent risk of BDI
Early stage of AC

< 4 days

EDEMA
HYPERHEMIA

INDURATION
HYPERVASCULARITY
ABSCESS
NECROSIS

Later
Acute Cholecystitis: technical tricks

- Suspension of round ligament

- Gallbladder decompression
• Extraction in a protective bag

• Routine drainage

Postop bile leaks: up to 2%
  • BDI
  • Cystic duct
  • Luschka duct
SEVERE CHOLECYSTITIS

1) ENDOVESICULAR APPROACH

incise the anterior part of the gallbladder from the fundus to the infundibulum and approach the cystic duct from inside

« the inside approach of the gallbladder »

!!! DO NOT DISSECT THE CALOT TRIANGLE !!!

• allow easy determination of the precise limits of the gallbladder infundibulum wall both from inside and outside !!!
• stay close to the gallbladder wall for dissection !!
• use gentle, blunt dissection (peanut swab)
• evacuate gallbladder content into an endobag
• difficult if gallbladder is full of stones

Dangerous area
Residual Hartman pouch

drawbacks

1) Biliary leak from unsecured remnant

2) Recurrence of biliary symptoms (retained calculi) $\rightarrow$ redo LC
2) **Subtotal cholecystectomy**

leave a piece of gallbladder wall
→ on the Calot triangle
→ on the R. side of the hilum / RHD
→ on the gallbladder bed

to protect CBD or anomalous right hepatic duct

* search the cystic duct from inside
* cannulate the cystic duct for IOC with a balloon catheter
* close the cystic duct from inside by suturing techniques
* destroy residual GB mucosa with Argon Beam Coagulator
* use routine subhepatic drainage

---

Beldi Surg Endosc 2003 ; 17 : 1437-1439
« The two most decisions in laparoscopic surgery are knowing
- when not to use it
- when to stop the procedure »

→ 15 %

J.G. Hunter
Acute Cholecystitis Management: Conclusions

- AC serious illness (Mortality 0.5 – 10%)
- AC has to be treated surgically
- Laparoscopic approach: OK
  - Accept higher conversion rate
- Early cholecystectomy (better ≤ 4 days)
  - Shorter total LOS
  - Longer operative time
  - Same morbidity
- Same principles of Surgical technique
  - In Selected cases consider subtotal or inside approach
- In seriously ill patients consider percutaneous cholecystostomy
Acute Cholecystitis Management

**severity assessment**

**Medical treatment**

**Grade I (mild)**
- Not Gr II & III

**Grade II (moderate)**
- WBC > 18000
- tender RUQ mass
- >72 hrs
- local "inflammation"

**Grade III (severe)**
- systemic organ failure

- Mild (Gr I) → early LC
- Moderate (Gr II) → urgent/early GB drainage
- Severe (Gr III) → urgent/early cholecystectomy

**Organ support**

- observation
- early/elective cholecystectomy
- observation

= response
Cholecystectomy & CIRRHOSIS?
The surgical risk


Cholecystectomy in cirrhotic patients:
A formidable operation

- Open Cholecystectomy and CBD exploration in decompensated cirrhotic patients: 25% mortality

Schwartz. Surgery 1981

Biliary tract surgery and cirrhosis:
A critical combination

57% massive bleeding
15% mortality

Open cholecystectomy:
Morbidity: 5 to 25%
Mortality: 7 to 20% (Palanivelu JACS 2006)
Cholecystectomy in Cirrhotic patients: Can be more challenging ...

- Abdominal wall collaterals
- Ascitis
- Adhesions and neovascularity
- Difficulty to retract the liver
- Exposure of the Callot Triangle
- Bleeding from the liver bed
- High risk hilum (cavernoma)

25 pub, 344 patients: 265 Child A, 73 B, 6 C (vs 3128 non cirrhotics)

<table>
<thead>
<tr>
<th>Operational details and post-operative course</th>
<th>Cirrhotic patients</th>
<th>Noncirrhotic patients</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute cholecystitis (%)</td>
<td>47</td>
<td>15</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Conversion rate (%)</td>
<td>7.06</td>
<td>3.64</td>
<td>0.0237</td>
</tr>
<tr>
<td>Operative time (min)</td>
<td>98.2</td>
<td>70</td>
<td>0.00467</td>
</tr>
<tr>
<td>Mortality (%)</td>
<td>0.59</td>
<td>0.13</td>
<td>0.133*</td>
</tr>
<tr>
<td>Morbidity (%)</td>
<td><strong>20.86</strong></td>
<td>7.99</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Wound infection (%)</td>
<td>1.6</td>
<td>1.5</td>
<td>0.9288*</td>
</tr>
<tr>
<td>Intraoperative bleeding (%)</td>
<td><strong>26.4</strong></td>
<td>3.1</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
Cholecystectomy & CIRRHOSIS?
The surgical risk: Lap vs Open

<table>
<thead>
<tr>
<th>Operative details and post-operative course</th>
<th>Laparoscopic cholecystectomy</th>
<th>Open cholecystectomy</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated operative blood loss (mL)</td>
<td>113</td>
<td>425.2</td>
<td>0.0154</td>
</tr>
<tr>
<td>Operative time (min)</td>
<td>123.3</td>
<td>150.2</td>
<td>0.04173</td>
</tr>
<tr>
<td>Mortality (%)</td>
<td>4.76</td>
<td>0</td>
<td>&gt; 0.99</td>
</tr>
<tr>
<td>Morbidity (%)</td>
<td>9.52</td>
<td>13.8</td>
<td>0.5972</td>
</tr>
<tr>
<td>Wound infection (%)</td>
<td>0</td>
<td>0.13</td>
<td>0.0547</td>
</tr>
<tr>
<td>Length of hospital stay (d)</td>
<td>6</td>
<td>12.2</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

LC is safe for Child A&B patients
As compared with OC, LC: ↓ blood loss, shorter hospital stay

Puggioni J Am Coll Surg 2003
Indications & Preoperative management

- To avoid unnecessary surgery → strict selection
- Always keep in mind the possibility of further LT
- Calculation of the Child and MELD scores
- Preoperative correction of the coagulopathy (FFP, Platelets)
  (Plt if <50,000/mm³, FFP if PTT<50%)

Technical tricks

- Pay attention to periumbilical varices (infraumbilical, open)
- Transilumination of the abdominal wall to identify major collaterals
- Placement of the subxiphoid port to the right of the midline to avoid umbilical vein in the falciform ligament
- Avoid traction on gallbladder (avulsion of the GB from liver bed)
- Always privilege the safety: po cholangiography, hemostatic agents, drain

Cholecystectomy & CIRRHOSIS?
Reasonable recommendations
Laparoscopic Cholecystectomy

*Take home message*
Laparoscopic Cholecystectomy: What to do in case of CBDS?

**Ways to extract CBDS:**

1. *Trans-cystic*

2. *Choledocotomy*
   - « Milking » of CBD & CD
   - Fogarty
   - Dormia Basket
   - Cholangioscopy

**BGES**

*The Belgian Group for Endoscopic Surgery*
Ways to extract CBDS: *Trans-cystic*

1. Trans-cystic route IF:
   - small stones
   - Cystic Duct implantation is direct & short

2. Complications of trans-cystic route:
   - Rupture of CD
   - Posterior perforation of CBD by Dormia
Ways to extract CBDS: **Choledocotomy**

1. Choledocotomy route IF:
   - No local inflammation
   - Dilated CBD > 8mm