

Difficult Laparoscopic Cholecystectomy, Primum non nocere!

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Abstract:

Cholecystectomy is one of the most commonly performed general surgical procedures and laparoscopic cholecystectomy is the standard of care for gallstones. A surgeon will often encounter difficult situations during cholecystectomy where decision making is of vital importance and any wrong move can alter the course of surgery and consequently the patient's life. Various pre-operative variables and intra-operative findings are used to predict and describe a difficult cholecystectomy. It is mandatory for the surgeon to perform a thorough pre-operative evaluation to identify a potentially difficult gallbladder by correlating a careful history and examination with laboratory and radiological findings. Pre-operative identification of a difficult cholecystectomy helps the surgeon to plan for difficult circumstances ahead of surgery and also to counsel the patient about it before taking consent. Laparoscopic cholecystectomy is not a simple procedure and must be performed with utmost carefulness and diligence. Conversion to open procedure must not be regarded as a failure or incompetence but as sound judgement instead to avert a potentially serious complication.

Keywords: Laparoscopic cholecystectomy, difficult gallbladder, subtotal cholecystectomy, Retained gallstones

Introduction:

Laparoscopic cholecystectomy is the worldwide gold standard for gallstone disease owing to its decreased morbidity, shorter hospital stay and faster recovery. Cholecystectomy for a difficult gallbladder poses an increased surgical risk than a standard routine cholecystectomy.¹ Pre-operative identification of difficult gallbladder helps the surgeon to plan surgery and be prepared for a difficult situation. It also helps the patient understand their treatment, expected treatment outcome and related complications and understand conversion to an open procedure.² Several predictors are used to identify a difficult gallbladder. These may include acute cholecystitis, raised white cell count and a shrunken thick-walled (>4mm) gallbladder. Operative findings may include advanced inflammation with adhesions and a thick walled, distended, gangrenous or perforated gallbladder.³ This article describes-

the different predictors of a difficult gallbladder and various bailout procedures once such a difficulty is encountered during cholecystectomy.

Discussion:

Despite being the standard care for gallstone disease and one of the most commonly performed surgical procedures, laparoscopic cholecystectomy is still associated with higher rates of biliary injury of 0.4%, contrary to 0.1-0.2% for open cholecystectomy. Some individuals report up to 1.5% for biliary injury in the laparoscopic group.⁴ The risk of iatrogenic injuries rises with difficulty in pre-operative identification of the anatomy. A difficult cholecystectomy may be associated with life-altering or life-threatening complications like ductal, vascular and visceral injuries.⁵ Acute or chronic inflammation distorts anatomy and makes dissection and identification of structures in the hepato-cystic triangle

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dangerously difficult. Severe acute inflammation causes the neck and infundibulum of the gallbladder to adhere with the bile ducts. Chronic inflammation causes the gallbladder to shrink and become fibrotic resulting in fusion between the cystic duct, cystic artery and the bile ducts. Gallbladder may develop adhesions with duodenum and colon, subsequently fistulizing in them (Mirizzi syndrome). Omental adhesions with the gallbladder pull up the duodenum and colon, making them prone to iatrogenic injury. Structural anomalies may further compound the situation increasing the risk of iatrogenic injuries.^{6,7}

Various systems and guidelines have been described to grade the severity of cholecystitis by anatomic criteria and to predict morbidity.

Tokyo guidelines stratify cholecystitis into three grades depending upon the severity of inflammation and associated comorbidities. Grade-I is mild cholecystitis without systemic illness, making for a safe cholecystectomy. Grade-II is moderate cholecystitis with advanced inflammation causing difficulty in cholecystectomy. It includes any of: leukocytosis $>18000\text{ cc}^3$, palpable tender mass in right hypochondrium, duration >72 hours, localized peritonitis, pericholecystic abscess, liver abscess and gangrenous or emphysematous cholecystitis. Grade-III is severe cholecystitis with organ dysfunction: hypotension, mental status changes, renal or respiratory failure.^{8,9} AAST classifies acute cholecystitis as: Grade-I acute cholecystitis, Grade-II gangrenous or emphysematous cholecystitis, Grade-III localized perforation, abscess or fistula, Grade-IV localized peritonitis and Grade-V as generalized peritonitis.¹⁰ Similarly, the Parkland Grading Scale describes the severity of cholecystitis from a normal looking gallbladder (Grade-I) to a necrotic and perforated gallbladder (Grade-V) without considering systemic illness.¹¹ These scoring systems are used in combination with Charlson Comorbidity Index (CCI) and American Society of Anesthesiologists Physical Status (ASA-PS) classification to assess overall risk and predict survival/mortality in patients undergoing sur-

gery based on their health status and associated comorbidities.¹² Several factors are described as pre-operative and intra-operative predictors of a difficult gallbladder: age >60 years, male gender, obesity with $\text{BMI} >30\text{ kg/m}^2$, acute cholecystitis especially with duration of symptoms >72 - 96 hours, increasing number of biliary colic attacks, ASA-PS scoring >2 , previous hospitalization for cholecystitis, previous cholecystostomy, previous upper abdominal surgery, palpable gallbladder, total leukocyte count $>15000/\text{cc}^3$, raised bilirubin level, large stone(s), impacted stone, thick-walled and contracted gallbladder, fluid collection around the gallbladder, dense vascular adhesions around gallbladder, empyema, gangrene or perforated gallbladder, Mirizzi's syndrome, cirrhosis, portal hypertension, coagulopathy, prolonged operation time, bleeding and conversion to open procedure.^{13,14} Optimal timing for cholecystectomy in acute cholecystitis is debatable but consensus tilts towards 72 hours of symptoms. Some authors go up to one week since symptoms started. Surgery after this duration must be considered difficult and best avoided until inflammation settles, usually 6-12 weeks.¹⁵ WBC counts $>15000/\text{cc}^3$ in a diabetic may be associated with gangrenous cholecystitis that may need percutaneous cholecystostomy followed by delayed cholecystectomy.¹⁶ If found per-operatively, cholecystostomy or subtotal cholecystectomy may be performed. This can be done laparoscopically or open, depending upon available skills and expertise.^{17,18} Perforated and emphysematous cholecystitis are associated with age >60 , male gender, fever, WBC >15000 and ultrasound findings. They have a higher rate of morbidity and mortality. Conversion to open, cholecystostomy or subtotal cholecystectomy may be required.^{19,20}

Patients with portal hypertension and cirrhosis must undergo pre-operative evaluation before surgery. Child-Pugh and MELD (Model for End-Stage Liver Disease) scores must be determined. Contrast enhanced CT with portal phase may be required to identify varices around umbilicus, porta-hepatis and gallbladder. Open-umbilical access may lead to hemorrhage from umbilical varices and recanalized umbilical vein,

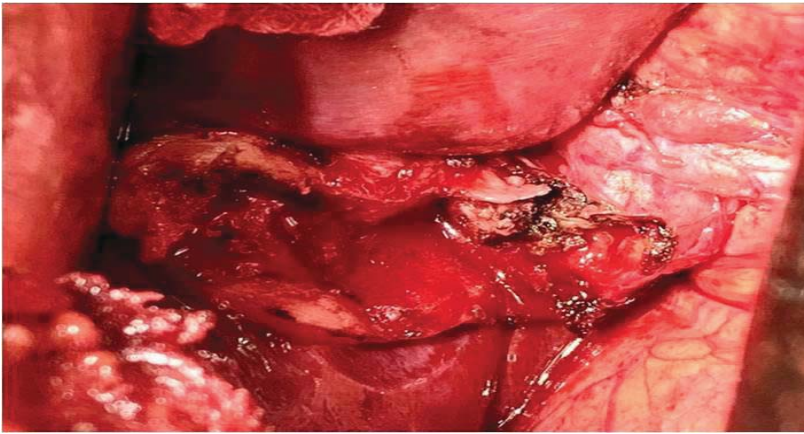


Figure: Subtotal cholecystectomy converted to open. Note the remnant posterior wall and the fusion of the infundibulum with the portal structures

hence, Veress needle may be preferable. Coagulation studies and blood typing are necessary to counter inadvertent bleeding. Advanced energy device may be required for dissection. The surgeon must keep a low threshold for conversion to open surgery, subtotal cholecystectomy or even aborting the procedure if conditions around the gallbladder do not warrant a safe cholecystectomy.^{21,22}

Iatrogenic gallbladder perforation with spillage of gallstones is not uncommon. Retained gallstones can cause chronic abdominal pain, fever, sub-phrenic & retro-peritoneal abscesses, empyema, intestinal obstruction & perforation, fistula formation, discharging sinus through the trocar site, retro-peritoneal actinomycosis, foreign-body granuloma mimicking a retro-peritoneal tumor. Retained stones can also result in hemoptysis and cholelithoptysis (expectoration of gallstones). Meticulous stone removal and thorough lavage is considered enough treatment by most authors unless the patient develops symptoms. Some authors advocate conversion to laparotomy for stone extraction but is generally not recommended.²³⁻²⁷ Dropped clips may also pose similar problems: subphrenic abscess, empyema, intestinal obstruction and fistula formation.²⁷ In morbid obesity, the umbilicus is displaced downward and lies lower than the umbilical scar at the linea alba. This may require the camera port to be placed at a higher level preferably 15cm below the xiphoid process,

via the Hassan technique or Veress needle. Pre-operatively, the patient may be advised 1400 calorie diet daily for two weeks to reduce the bulk of liver for facilitating exposure.^{28,29} In patients with previous abdominal surgery, umbilical access may be difficult and dangerous due to bowel adhesions. Several locations other than umbilicus are used for pneumo-peritoneum in such situations. Access may be gained in the epigastrium or in a free upper quadrant. Palmer's point lies 3cm below costal margin in the mid-clavicular line. It is used to insufflate the peritoneal cavity through Veress needle in the left hypochondrium after gastric decompression. It is also used in obese patients where the umbilicus is located caudally close to the aortic bifurcation or very lean patients where the umbilicus lies closer to aorta. The right hypochondrium can be used if the previous surgery was for spleen, left colon or stomach and vice versa. Lee-Huang point lies in the middle of the abdomen between xiphoid and umbilicus. It utilizes Veress needle and is used when previous surgery was below the umbilicus.^{30,31} Optical trocars are also useful in getting access in a previously operated abdomen. These have transparent tips that allow direct visualization of every layer of abdominal wall being traversed by the trocar utilizing a zero degree camera.³²

Mirizzi syndrome is a rare but challenging complication of gallstones. Chronically impacted stone(s) at the Hartman's pouch cause fusion of the gallbladder with bile ducts causing external compression and jaundice (Type-I). The stone may later erode into the duct causing a cholecysto-choledochal fistula. According to Csendes, the fistula may involve one third of the circumference of the bile duct (Type-II), two thirds (Type-III) or complete circumference of the bile duct (Type-IV). The gallbladder may also form a fistula with the duodenum or colon (Type-V) leading to gastric outlet obstruction (Bouveret syndrome) or intestinal obstruction (gallstone ileus) and pneumobilia (Rigler's triad).³³ Mirizzi syndrome may mimic or be associated with biliary cancer and poses a diagnostic difficulty. Type-II onwards, Mirizzi syndrome may require complex reconstructive

procedures like hepatico-jejunostomy, usually performed as open surgery but is also being performed laparoscopically.³⁴

How to bail-out the situation: When faced with difficult situations like above, there are various bail-out procedures recommended to safely sail away from danger and avert an injury. Decision making is of vital importance in difficult gallbladders and treatment must be individualized based on operative findings. Cognizance of the problem the surgeon is facing and knowing when to stop and redirect surgery is paramount to performing safe cholecystectomy which may not be a complete cholecystectomy. Patient safety takes precedence over complete removal of the gallbladder.^{35,36}

Subtotal cholecystectomy (laparoscopic or open) has long been recognized as a safe bail-out procedure during difficult circumstances. Subtotal cholecystectomy may be required when a critical view of safety cannot be achieved e.g., portal hypertension, severe cholecystitis and gangrenous or perforated gallbladder.³⁷ For a subtotal cholecystectomy; leave the posterior wall and coagulate its mucosa, remove impacted stone(s), leave a 2cm remnant at gallbladder neck, oversee the neck remnant (reconstituting subtotal) or leave it open (fenestrating subtotal) and put a drain to the operative area.³⁸ When cholecystectomy cannot be performed in acute situations or cannot be completed due to difficulty, cholecystostomy followed by interval cholecystectomy is a safe option.³⁹ The surgeon may also seek help from a colleague. Sometimes it may become necessary to abort the procedure altogether for another day till the inflammation subsides.⁴⁰

Conclusion:

Identifying and managing a difficult gallbladder is difficult but important to avoid iatrogenic biliary, vascular and visceral injuries. The surgeon must know the predictors of a difficult gallbladder and must assess a difficulty ahead of time and have plans ready. He should know the different bail-out procedures and use his judgement to utilize the right one. The goal should be

to safely conclude the operation rather to completely remove a difficult gallbladder, jeopardizing other viscera and compromising patient safety. *Primum non nocere!*

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Zafar Ullah Khan, collected the data, references and did the writeup.

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