

## Patient Compliance in Laparoscopic Cholecystectomy versus Open Cholecystectomy

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### ABSTRACT

Gallbladder disease is one of the most mutual procedures done worldwide. Earlier, an open technique was the regular procedure for cholecystectomy. This typically encompassed performing an intraoperative cholangiogram, and individuals regularly had a two to six-day post-operative hospital stay. With the introduction of laparoscopic surgery and the laparoscopic cholecystectomy in the early 1990s, the standards for cholecystectomy have changed to a laparoscopic technique. This technique presented a 30% increase in the overall performance of elective cholecystectomies. Nowadays, 92% of all cholecystectomies are performed laparoscopically. There are numerous signs in performing open cholecystectomies, and this procedure residues a significant part of training for the general surgery resident. Laparoscopic cholecystectomy is indicated for the treatment of cholecystitis (acute/chronic), gallstone pancreatitis, acalculous cholecystitis, biliary dyskinesia, symptomatic cholelithiasis, and gallbladder masses/polyps. These indications are the same for an open cholecystectomy. Cases of gallbladder cancers are usually best treated with open cholecystectomy.

**Keywords:** Gallbladder, Laparoscopic cholecystectomy, symptomatic gallstones, open cholecystectomy, Cholecystitis, Choledocholithiasis.

### INTRODUCTION

Gallbladder disease is one of the most mutual procedures done worldwide. Earlier, an open technique was the regular procedure for cholecystectomy. This typically encompassed performing an intraoperative cholangiogram, and individuals regularly had a two to six-day post-operative hospital stay <sup>[1]</sup>. Laparoscopic cholecystectomy is a minimally invasive surgical procedure for removal of a diseased gallbladder <sup>[2]</sup>.

Most open cholecystectomies performed to deliver symptoms associated to biliary colic from cholelithiasis, to treat complications of gallstones (e.g., acute cholecystitis and biliary pancreatitis), or as incidental cholecystectomies performed during other open abdominal procedures. Laparoscopic cholecystectomy is indicated for the treatment of cholecystitis (acute/chronic), gallstone pancreatitis, acalculous cholecystitis, biliary dyskinesia, symptomatic cholelithiasis, and gallbladder masses/polyps. These indications are the same for an open cholecystectomy. Cases of gallbladder cancers are usually best treated with open cholecystectomy <sup>[3]</sup>. While the reality of the matter is that no operation has been more significantly influenced by the appearance of laparoscopy than cholecystectomy has, it is similarly genuine that no method has been more instrumental in introducing the laparoscopic age than laparoscopic cholecystectomy has. Laparoscopic cholecystectomy has quickly turned

into the strategy of decision for routine gallbladder removal and is at present the most usually performed significant abdominal method in Western nations <sup>[2]</sup>.

A National Institutes of Health agreement statement in 1992 expressed that laparoscopic cholecystectomy gives a secure and effective treatment for most patients with symptomatic gallstones and has turned into the treatment of decision for several patients <sup>[4]</sup>. This method has pretty much-finished endeavors at the noninvasive administration of gallstones.

Laparoscopic cholecystectomy diminishes postoperative discomfort, reduces the requirement for postoperative analgesia, reduces the hospital stay from 1 week to less than 24 hours, and returns the patient to full movement inside 1 week (contrasted with 1 month after open cholecystectomy). Laparoscopic cholecystectomy likewise gives enhanced cosmesis and enhanced patient fulfillment as contrasted and open cholecystectomy <sup>[5, 6]</sup>. Although direct operating room and recovery room costs are higher for laparoscopic cholecystectomy, the reduced length of hospital stay indicates to cost savings. Quicker return to typical activity can lead to indirect cost savings <sup>[7]</sup>. In lower-income countries, open cholecystectomy can be more cost-effective than the laparoscopic comparable and can consequently be desired on that basis <sup>[8]</sup>.

Trials have demonstrated that laparoscopic cholecystectomy patient in outpatient settings and those in inpatient settings recuperate similarly well, showing that a more noteworthy extent of patients ought to be offered the outpatient methodology [9]. Laparoscopic cholecystectomy has gotten almost general acknowledgment and is presently viewed as the paradigm standard for the treatment of symptomatic cholelithiasis [9, 10].

Open cholecystectomy ought to be considered in patients with cirrhosis and bleeding disorders, in addition to pregnant women. In patients with advanced cirrhosis and bleeding disorders, potential bleeding might be hard to control laparoscopically, and an open approach can be more practical. Similarly, patients with portal hypertension often have a recannulized umbilical vein, and placing ports in these patients can cause significant hemorrhage. Even though laparoscopic cholecystectomy has been showed to be safe in all trimesters of pregnancy, along with possibly allied with less maternal and fetal complications [11], an open procedure ought to be considered, particularly in the third trimester, since laparoscopic port placement and insufflation might be difficult. Open cholecystectomy is similarly

indicated, although uncommonly, in patients who have trauma to the right upper quadrant and in the infrequent cases of penetrating trauma to the gallbladder.

**MATERIALS AND METHODS**

• **Data Sources and Search terms**

We conducted this review using a comprehensive search of MEDLINE, PubMed, EMBASE, Cochrane Database of Systematic Reviews, and Cochrane Central Register of Controlled Trials from January 1, 1988, through July 28, 2017.

• **Data Extraction**

Two reviewers independently reviewed studies, abstracted data, and resolved disagreements by consensus. Studies were evaluated for quality. A review protocol was followed throughout.

**The study was done after approval of ethical board of King Abdulaziz university.**

**Indications**

Indications for cholecystectomy, whichever open or laparoscopic, are commonly allied to symptomatic gallstones or complications related to gallstones. The most mutual of these indications are the following (table 1):

percutaneous cholecystostomy or percutaneous transhepatic cholangiography ought to be considered in lieu of cholecystectomy.

Absolute contraindications for laparoscopic cholecystectomy include an incapability to tolerate general anesthesia and uncontrolled coagulopathy. Individuals with severe obstructive pulmonary disease or congestive heart failure (e.g., cardiac ejection fraction <20%) cannot tolerate carbon dioxide pneumoperitoneum and can be better functioned with open cholecystectomy if cholecystectomy is absolutely essential. Gallbladder cancer must be viewed as a contraindication for laparoscopic cholecystectomy. In the event that gallbladder cancer is analyzed intraoperatively, the operation should be changed over to an open procedure. Hypothetically, an open procedure permits a more controlled execution, with less possibility of spillage; likewise, lymph nodes can be examined intraoperatively to stage the illness [12].

Several conditions when felt to be contraindications for laparoscopic cholecystectomy (e.g., empyema of the gallbladder, ventriculoperitoneal shunt, gangrenous gallbladder, obesity, bilioenteric fistulae, coagulopathy, previous upper abdominal procedures, cirrhosis, and pregnancy) are never again considered contraindications, however, are

**Table1:** Indications for cholecystectomy

<b>Common indications</b>	<b>Other indications</b>	<b>Indications for forgoing laparoscopy</b>
<b>Biliary colic</b>	Biliary dyskinesia	Suspected or confirmed gallbladder cancer
<b>Biliary pancreatitis</b>	Gallbladder cancer	Type II Mirizzi syndrome (cholecystobiliary fistula)
<b>Cholecystitis</b>	Prophylactic cholecystectomy during various intra-abdominal procedures (controversial)	Gallstone ileus
<b>Choledocholithiasis</b>		Severe cardiopulmonary disease

**Contraindications**

Absolute contraindications for continuing with an open cholecystectomy are little. Such absolute contraindications are narrow to severe physiologic derangement or cardiopulmonary disease that disallows general anesthesia. In cases of terminal disease, temporizing procedures such as

recognized to require extraordinary care and arrangement of the patient by the surgeon and cautious weighing of hazard against advantage. As surgeons have accumulated extensive experience with the laparoscopic technique, these contraindications have been discounted, and

reports abound of successfully performed cases [13, 14].

**Preparation**

• **Equipment preparation**

Equipment for open cholecystectomy includes instruments common to a major instrument tray.

**Table 2:** Equipment required for open vs. laparoscopic cholecystectomy.

Open Cholecystectomy	Laparoscopic Cholecystectomy
<p><b>Kelly clamps, Kocher forceps, needle holders, scissors, clips, suctions, knife/knife handles, forceps, retractors, right angle clamps, Kitner dissectors, and electro-surgical devices should be assembled</b></p>	<p>Light source with two video monitors (for the surgeon and the assistant)</p>
	<p>Laparoscope, 0° or 30°</p>
	<p>Standard gas insufflation equipment</p>
	<p>Hasson trocar</p>
<p><b>Balfour retractors, Bookwalter retractors, or other self-retaining retractors can be used, according to the surgeon's preference</b></p>	<p>Trocars, 5 mm (2)</p>
	<p>Subxiphoid trocar, 11 mm (this can be replaced with another 5-mm trocar if a 5-mm laparoscopic clip applier is available)</p>
	<p>Blunt graspers</p>
	<p>Maryland dissector and L-hook cautery</p>
<p><b>Sutures or clips can be used to control the cystic duct and artery, depending on the surgeon's preference and the size of the structures (see Technique); long instruments may be needed, depending on the body habitus of the patient</b></p>	<p>Electrocautery equipment</p>
	<p>Laparoscopic suction irrigator</p>
	<p>Laparoscopic clip applier</p>
	<p>Endoscopic ligature loop (eg, Endoloop; Ethicon Endo-Surgery, Blue Ash, OH)</p>
	<p>Cotton swab affixed to a 5-mm shaft (eg, Endo Peanut; Covidien, Mansfield, MA)</p>
	<p>Endoscopic retrieval pouch (eg, Endo Catch; Covidien, Mansfield, MA)</p>

• **Patient Preparation**

**Table 3: Patient preparation for open Vs. laparoscopic cholecystectomy**

	<b>Open Cholecystectomy</b>	<b>Laparoscopic Cholecystectomy</b>
<b>Anaesthesia</b>	Most open cholecystectomies are performed with general anaesthesia. Less commonly, the procedure is done with regional (epidural or spinal) anaesthesia; in rare instances, it is done with local anaesthesia.	Because pneumoperitoneum is necessary for laparoscopic cholecystectomy, general anaesthesia with intubation is routinely required. Case reports of epidural anaesthesia <sup>[15]</sup> and a pilot study comparing spinal anaesthesia with general anaesthesia in young, thin, healthy patients showed no significant differences in outcome <sup>[16]</sup> . Further studies involving acute cholecystitis and an older patient population are needed.
<b>Positioning</b>	Patients are positioned supine with the arms extended. Placing a folded blanket or bump underneath the patient's right back or inverting the table may be beneficial.	For this procedure, the patient should be in the supine position. Peripheral intravenous lines are inserted, and electrocardiography, pulse oximetry, and blood pressure monitors are placed. The patient is intubated and general anaesthesia initiated. The patient's arms are abducted or tucked comfortably at the sides. The two laparoscopic towers are situated on either side of the patient's trunk, toward the head. The surgeon stands on the patient's left, and the assistant stands on the right. An additional assistant, if present, can hold the laparoscope, but this is not essential.

**Technique**

• **Open Cholecystectomy Technique**

Once the patient is properly anesthetized and prepared, a right subcostal (Kocher) incision is the most frequently used incision and allows excellent exposure of the gallbladder bed and cystic duct. Otherwise, an upper midline incision may be used when other concomitant operations are planned and a wider exposure is required. Adequate exposure is gained by utilizing packs and retractors. It is critical to acquire good visualization of the gallbladder, Triangle of Calot, and bile ducts. Care should be taken to avoid liver harm from the retractors. Once the surgeon has effectively recognized all of the structures of the porta hepatis, the gallbladder is grasped with clamps and operated to enable the best visualization. Now, the choice is made to remove the gallbladder either from the top-down or classically, from the Triangle of Calot up. The cystic duct is first recognized and divided among hemoclips as is the cystic artery. Definitive identification of these structures is essential. The gallbladder at that point can be expelled from the gallbladder bed of the liver utilizing either electrocautery or a Harmonic scalpel. Inspection of the gallbladder bed is made to distinguish and address any bleeding or bile leaks from the duct of Luschka. Operative cholangiogram or common

bile duct exploration is reliant on factors allied with common bile duct stones, for example, elevated bilirubin and dilated common bile duct (over 8 mm). The abdomen is then closed in a standard multilayer fashion<sup>[17, 18]</sup>.

There are times where the gallbladder is tense and distended from inflammation that might require to be drained with a decompression needle before starting the procedure. Since in laparoscopy, the technique is depends on surgeon experience and comfort. With either technique, the surgeon ought to endeavour to gain an excellent critical view of safety before clipping or cutting. A few cases might present with a lot of the inflammation or Hartmann's pouch is so fibrotic that "bailout" schemes are required; these might contain of a cholecystectomy tube, partial cholecystectomy, or sometimes of necrosis leaving the back wall. Closed suction drains may be placed at the carefulness of the surgeon<sup>[19, 20]</sup>.

• **Laparoscopic Cholecystectomy Technique**

After induction of anesthesia and intubation, the laparoscopic cholecystectomy may begin.

First, insufflation of the abdomen is attained to 15 mmHg by CO2. Following, four small incisions are prepared in the abdomen for trocar placement (1 supraumbilical, 1 subxiphoid, and 2 right subcostal). Using a laparoscope (camera) and long appliances the gallbladder is extended over the liver. This permits for exposure of the proposed

region of the hepatocystic triangle. Cautious dissection is carried out to attain the critical view of safety<sup>[3, 21]</sup>. This view is defined as:

- Clearance of fibrous and fatty tissue from the hepatocystic triangle
- The presence of two tubular structures, and only two, entering into the base of the gallbladder
- The separation of the lower third of the gallbladder from the liver to visualize the cystic plate.

Once this view is effectively attained, the operative surgeon could proceed with assurance that he/she has isolated the cystic duct and cystic artery. Both structures are cautiously clipped and transected. Electrocautery or harmonic scalpel is then utilized to fully detach the gallbladder from the liver bed. Haemostasis must be attained after the abdomen is permitted to deflate to 8 mmHg for 2 minutes. This method is active to avoid missing potential venous bleeding that may be tamponaded by elevated intra-abdominal pressure (15 mmHg). The gallbladder is removed from the abdomen in a specimen pouch<sup>[22, 23]</sup>.

## COMPLICATIONS

### • Open Cholecystectomy

Though, normally a safe procedure with limited morbidity and mortality<sup>[24]</sup>, open cholecystectomy does bring a risk of potential complications. Conventionally, the complication rate for this procedure has been stated to be in the range of 6-21%, however, this has likely decreased in the current period<sup>[25]</sup>. For patients with Child-Pugh class A or B cirrhosis who are undergoing cholecystectomy for symptomatic cholelithiasis, laparoscopic cholecystectomy has decreased complication rates and increased recovery as compared with open cholecystectomy.

### Bleeding and infection

Essential to any surgical procedure are the dangers of bleeding and infection. Potential sources of haemorrhage comprise the liver bed, the hepatic artery and its branches, and the porta hepatis. Most bleeding sources are acknowledged and addressed intraoperatively. Nevertheless, occasional postoperative haemorrhage can outcome in substantial hemoperitoneum. Infectious complications range from skin and soft-tissue infection to intra-abdominal abscess. The danger of infection is reduced by preserving meticulous sterile technique, in addition to eluding leakage of bile into the abdominal cavity. Should significant bile or stone spillage happen, thorough irrigation might help decrease the danger of intra-

abdominal infection, all spilled stones ought to be removed to avoid further abscess formation<sup>[26]</sup>.

### Biliary complications

Complications identified with the biliary framework incorporate bile leaks and CBD wounds, which can bring about biliary strictures. Bile leaks can be caused by clasps or ligatures slipping off the cystic channel stump, wounds to the bile ducts, or, most ordinarily, transected Luschka pipes. Patients may give relentless stomach torment, sickness, retching, and lifted liver capacity test comes about. Once analyzed, an endoscopic retrograde cholangiopancreatography (ERCP) can enable further to portray the break and in addition give remedial choices. Maybe the most sullen inconvenience identified with open cholecystectomy is damage to the CBD. Bile duct injury, however as of now a known confusion amid open cholecystectomy, has expanded twofold with the coming of laparoscopic cholecystectomy (1 damage PER 200-5,000 cases)<sup>[27]</sup>. At the point when a bile duct injury is perceived intraoperatively, counsel an accomplished hepatobiliary specialist. In the event that one isn't accessible, firmly consider exchanging the patient to a tertiary nurture complete care. Postponed analysis of a bile duct injury can happen a long time to a long time after the underlying operation with height of liver capacity test comes about or, at times, cholangitis. As noted beforehand, these patients ought to be alluded to experienced hepatobiliary places for assessment and authoritative treatment.

### • Laparoscopic Cholecystectomy

Common complications comprise but are not limited to bleeding, infection, and damage to surrounding structure. Bleeding is a mutual complication as the liver is a very vascular organ. Experienced surgeons should be knowledgeable regarding anatomical anomalies of arteries to avoid potential significant blood loss. The most serious complication is an iatrogenic injury of the common bile/hepatic duct. Injury to either of these structures can need a further surgical procedure to divert the flow of bile into the intestines. This procedure regularly needs a specially trained hepatobiliary surgeon. Finally, conversion to an open procedure has become an uncommon event as the experience of surgeons has increased over the years. Change to an open technique generates a larger abdominal incision, causes significant pain control issues postoperatively, and leads to a cosmetically displeasing scar.

**CONCLUSION**

Laparoscopic cholecystectomy residues the gold standard to all other treatment modalities is judged. Change from laparoscopic to open cholecystectomy must be based on the sound clinical judgment of the surgeon and not be due to a lack of individual expertise.

**REFERENCES**

1. **Maehira H, Kawasaki M, Itoh A, Ogawa M, Mizumura N, Toyoda S, Okumura S, Kameyama M(2017):** Prediction of difficult laparoscopic cholecystectomy for acute cholecystitis. *J. Surg. Res.*, 216:143-148.
2. **Litwin DE, Cahan MA(2008):** Laparoscopic cholecystectomy. *Surg Clin North Am.*, 88(6):1295-313.
3. **Kartal K, Uludag M(2016):** Can 4-port laparoscopic cholecystectomy remain the gold standard for gallbladder surgery? *Ann Ital Chir.*, 87:13-7.
4. **National Institutes of Health (NIH)(1992):** Gallstones and Laparoscopic Cholecystectomy. NIH Consensus Statement. NIH. Available at <http://consensus.nih.gov/1992/1992GallstonesLaparoscopy090html.htm>.
5. **Shea JA, Berlin JA, Bachwich DR, Staroscik RN, Malet PF, McGuckin M(1998):** Indications for and outcomes of cholecystectomy: a comparison of the pre and postlaparoscopic eras. *Ann Surg.*, 227(3):343-50.
6. **Calland JF, Tanaka K, Foley E, Bovbjerg VE, Markey DW, Blome S et al. (2001):** Outpatient laparoscopic cholecystectomy: patient outcomes after implementation of a clinical pathway. *Ann Surg.*, 233(5):704-15.
7. **Nealon WH, Bawduniak J, Walser EM(2004):** Appropriate timing of cholecystectomy in patients who present with moderate to severe gallstone-associated acute pancreatitis with peripancreatic fluid collections. *Ann Surg.*, 239(6):741-9.
8. **Silverstein A, Costas-Chavarri A, Gakwaya MR, Lule J, Mukhopadhyay S, Meara JG et al. (2016):** Laparoscopic Versus Open Cholecystectomy: A Cost-Effectiveness Analysis at Rwanda Military Hospital. *World J Surg.* [europepmc.org/abstract/med/27905020](http://europepmc.org/abstract/med/27905020)
9. **Lillemoe KD, Lin JW, Talamini MA, Yeo CJ, Snyder DS, Parker SD(1999):** Laparoscopic cholecystectomy as a "true" outpatient procedure: initial experience in 130 consecutive patients. *J Gastrointest Surg.*, 3(1):44-9.
10. **McSherry CK(1989):** Cholecystectomy: the gold standard. *Am J Surg.*, 158(3):174-8.
11. **Sedaghat N, Cao AM, Eslick GD, Cox MR(2017):** Laparoscopic versus open cholecystectomy in pregnancy: a systematic review and meta-analysis. *Surg Endosc.*, 31(2):673-679.
12. **Roa I, Araya JC, Wistuba I, Villaseca M, de Aretxabala X, Gómez A et al. (1994):** Laparoscopic cholecystectomy makes difficult the analysis of gallbladder mucosa. [Morphometric study]. *Rev Med Chil.*, 122(9):1015-20.
13. **Kwon YJ, Ahn BK, Park HK, Lee KS, Lee KG(2013):** What is the optimal time for laparoscopic cholecystectomy in gallbladder empyema?. *Surg Endosc.*, 9(3):109-15.
14. **Kiviluoto T, Sirén J, Luukkonen P, Kivilaakso E(1998):** Randomised trial of laparoscopic versus open cholecystectomy for acute and gangrenous cholecystitis. *Lancet*, 351(9099):321-5.
15. **Tzovaras G, Fafoulakis F, Pratsas K, Georgopoulou S, Stamatidou G, Hatzitheofilou C(2008):** Spinal vs general anesthesia for laparoscopic cholecystectomy: interim analysis of a controlled randomized trial. *Arch Surg.*, 143(5):497-501.
16. **El-Dawlatly AA, Al-Dohayan A, Fadin A(2007):** Epidural Anesthesia for Laparoscopic Cholecystectomy In A Patient With Dilated Cardiomyopathy: Case Report And Review Of Literature. *The Internet Journal of Anesthesiology*, <https://www.ncbi.nlm.nih.gov/pubmed/17111111>
17. **Gomes CA, Junior CS, Di Saveiro S, Sartelli M, Kelly MD, Gomes CC, Gomes FC, Corrêa LD, Alves CB, Guimarães SF(2017):** Acute calculous cholecystitis: Review of current best practices. *World J Gastrointest Surg.*, 9(5):118-126.
18. **Ece I, Ozturk B, Yilmaz H, Yormaz S, Şahin M(2017):** The effect of single incision laparoscopic cholecystectomy on systemic oxidative stress: a prospective clinical trial. *Ann Surg Treat Res.*, 92(4):179-183.
19. **Akahoshi K, Ochiai T, Takaoka A, Kitamura T, Ban D, Kudo A, Tanaka S, Tanabe M(2017):** Emergency Cholecystectomy for Patients on Antiplatelet Therapy. *Am Surg.*, 83(5):486-490.
20. **Bekki T, Abe T, Amano H, Fujikuni N, Okuda H, Sasada T, Yamaki M, Kobayashi T, Noriyuki T, Nakahara M(2017):** Complete torsion of gallbladder following laparoscopic cholecystectomy: A case study. *Int J Surg Case Rep.*, 37:257-260.
21. **Tsutsui N, Yoshida M, Kitajima M, Suzuki Y(2016):** Laparoscopic cholecystectomy using the PINPOINT endoscopic fluorescence imaging system with intraoperative fluorescent imaging: A case report. *Int J Surg Case Rep.*, 21:129-32.
22. **Sazhin VP, Sazhin IV, Pod"iablonkaia IA, Karlov DI, Nuzhdikhin AV, Aivazian SA(2016):** Etiology of "difficult" laparoscopic cholecystectomy. *Khirurgiia (Mosk)*, 1:61-66.
23. **Tropea A, Pagano D, Biondi A, Spada M, Gruttadauria S(2016):** Treatment of the iatrogenic lesion of the biliary tree secondary to laparoscopic cholecystectomy: a single center experience. *Updates Surg.*, 68(2):143-8.
24. **Sandblom G, Videhult P, Crona Guterstam Y, Svenner A, Sadr-Azodi O(2015):** Mortality after a cholecystectomy: a population-based study. *HPB (Oxford)*, 17(3):239-43.
25. **McAneny D(2006):** Open cholecystectomy. *Surg Clin North Am.*, 88(6):1273-94.
26. **Iannitti DA, Varker KA, Zaydfudim V, McKee J(2006):** Subphrenic and pleural abscess due to spilled gallstone. *JSL.*, 10(1):101-104.
27. **Metcalfe MS, Ong T, Bruening MH, Iswariah H, Wemyss-Holden SA, Maddern GJ(2004):** Is laparoscopic intraoperative cholangiogram a matter of routine?. *Am J Surg.*, 187(4):475-81.