

Original research article**A study on preoperative risk factors for converting laparoscopic to open cholecystectomy****¹Dr. V Abhishek, ²Dr. H Shivananda Prabhu, ³Dr. Lokesh B**¹Post Graduate, Department of General Surgery, Kasturba Medical College, Mangalore, Karnataka, India²Professor, Department of General Surgery, Kasturba Medical College, Mangalore, Karnataka, India³Assistant Professor, Department of General Surgery, Kasturba Medical College, Mangalore, Karnataka, India**Corresponding Author:**

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Abstract

Laparoscopic cholecystectomy has become the gold standard for treatment of symptomatic cholelithiasis and most of surgeries are done for acute cholecystitis. Even though the impact of laparoscopic cholecystectomy on biliary pathology is tremendous, surgeons continue to face challenges in laparoscopic cholecystectomy. Anatomical variations, severity of biliary disease, technical problems, altered depth perception visual misinterpretation leading to errors in judgment. All the patients presenting with pain abdomen are subjected to clinical evaluation in the form of detailed history, physical examination, local examination, laboratory investigations and Ultrasonographic parameters was recorded. Difficulty in gall bladder extraction was associated with distended gall bladder (9.6%) and presence end multiple stones (5.8%). A distended gall bladder or the presence of many stones leads to difficulty in the extraction of the specimen the epigastria port and the increase probability of gall bladder perforation during these manoeuvres.

Keywords: Risk factors, laparoscopic cholecystectomy, open cholecystectomy**Introduction**

The prevalence of gallbladder stone vary widely in different parts of the world. India it is estimated to be 4%. An epidemiological study restricted to rail road workers showed that north Indians have 7 times higher occurrence of gall stone as compared with south Indians ^[1].

Changing incidence in India is mainly attributed to westernization and availability of investigation that is ultrasound to urban as well as rural area and also because of crease affordability due to change in the socio-economic structure and the cost of investigations.

Because of increased incidence of gall stones and its variable presentations in India as and in the west, there is a great need for a study which can provide the information regarding the prevalence of the disease, various clinical presentation and management, outcomes of the disease ^[2].

Cholecystectomy is the removal of gall bladder and is mainly performed for symptomatic gall stones. Cholecystectomy is the commonest operation of the biliary tract and second most common operative procedure today.

Although laparoscopic cholecystectomy is currently preferred over open cholecystectomy for elective cholecystectomy, reports of randomized control trials comparing the choice of cholecystectomy either open or laparoscopic are still being conducted. Lap cholecystectomy is commonly performed in our set up ^[3].

Laparoscopic cholecystectomy has become the gold standard for treatment of symptomatic cholelithiasis and most of surgeries are done for acute cholecystitis. Even though the impact of laparoscopic cholecystectomy on biliary pathology is tremendous, surgeons continue to face challenges in laparoscopic cholecystectomy. Anatomical variations, severity of biliary disease, technical problems, altered depth perception visual misinterpretation leading to errors in judgement ^[4].

Laparoscopic cholecystectomy though effective and safe procedure yet can be difficult at time. Various problems faced are difficulty in creating pneurnoperitoneum, accessing peritoneal cavity, releasing adhesions, identifying anatomy, anatomical variation and extraction of gall bladder.

Laparoscopic cholecystectomy known to decreases postoperative pain and decreases the need for post-operative analgesia. Hospital stay is shortened from 1 week to 24 hrs. Patient can perform full activity within 7 days compared to 1 month after open cholecystectomy. It provides improved cosmesis and hence patient satisfaction compared to open cholecystectomy. Though the cost of operating room and recovery room are higher for laparoscopic cholecystectomy, it is compensated by shorter duration of hospital stay and early return to normal activity ^[5].

Laparoscopic cholecystectomy is the most common difficult laparoscopic surgery performed by surgeons all over the world. The factor leading to difficult laparoscopic cholecystectomy can be predicted. Every case should be considered as difficult until completed successfully. The level of difficulty depends on skill and experience of surgeon. This study was done in a teaching institute for two and a half years to determine predictors of difficult laparoscopic cholecystectomy [6].

Methodology

Study design: Prospective cross sectional study.

Sample size: With 95% confidence level and 90% power with mean and standard deviation sample size came up to 96.

Type of study: Prospective Observational study

Inclusion criteria

1. All patients admitted in General surgical wards of KMC Hospital undergoing Laparoscopic Cholecystectomy will be included in the study
2. Both sexes, 20 to 60 years

Exclusion criteria

1. Patients less than 18 yrs of age.
2. Patients with HIV, malignancies, tuberculosis.
3. Patients who won't give consent.

Definition of difficult laparoscopic cholecystectomy :surgeons with experience of doing more than 250 laparoscopic cholecystectomy over the last 5 years having difficulty in any part of the surgery and taking time more than 45 minutes.

All the patients presenting with pain abdomen are subjected to clinical evaluation in the form of detailed history, physical examination, local examination, laboratory investigations and Ultrasonographic parameters was recorded.

Results

Table 1: Umbilical Port Entry

Umbilical Port Entry			
		No	yes
		Count	Count
First Episode	No	66.0	9.0
	Yes	23.0	2.0
Repeated Attacks	No	23.0	2.0
	Yes	66.0	9.0
H/o Upper Abd Surgery	No	87.0	9.0
	Yes	2.0	2.0
Post ERCP	No	78.0	11.0
	Yes	11.0	0.0
BMI	<30	88.0	7.0
	>30	1.0	4.0
Upper Abdominal Scars/hernias	No	86.0	6.0
	Yes	3.0	5.0
Elevated TLC	No	73.0	8.0
	Yes	16.0	3.0
Abnormal LFT	No	79.0	11.0
	Yes	10.0	0.0
Elevated Amylase	No	82.0	11.0
	Yes	7.0	0.0
Gall Bladder Size	Contracted	8.0	1.0
	Distended	41.0	1.0
	Normal	40.0	9.0
Pericholecystic Fluid	No	83.0	11.0
	Yes	6.0	0.0
Peri-pancreatic Fluid	No	88.0	11.0
	Yes	1.0	0.0
Mutiple Stones	No	44.0	4.0
	Yes	45.0	7.0
Stone Size	<1cm	59.0	8.0
	>1cm	27.0	2.0
	No	3.0	1.0

Cirrhosis	No	87.0	10.0
	Yes	2.0	1.0

Table 2: Gallbladder Grasping

Gall Bladder Grasping			
		No	Yes
First Episode	No	48.0	27.0
	Yes	19.0	6.0
Repeated Attacks	No	19.0	6.0
	Yes	48.0	27.0
H/o Upper Abd Surgery	No	65.0	31.0
	Yes	2.0	2.0
Post ERCP	No	60.0	29.0
	Yes	7.0	4.0
BMI	<30	64.0	31.0
	>30	3.0	2.0
Upper Abdominal Scars/hernias	No	60.0	32.0
	Yes	7.0	1.0
Elevated TLC	No	55.0	26.0
	Yes	12.0	7.0
Abnormal LFT	No	62.0	28.0
	Yes	5.0	5.0
Elevated Amylase	No	61.0	32.0
	Yes	6.0	1.0
Gall Bladder Size	Contracted	1.0	8.0
	Distended	19.0	23.0
	Normal	47.0	2.0
Pericholecystic Fluid	No	64.0	30.0
	Yes	3.0	3.0
Peri-pancreatic Fluid	No	66.0	33.0
	Yes	1.0	0.0
Mutiple Stones	No	32.0	16.0
	Yes	35.0	17.0
Stone Size	<1cm	46.0	21.0
	>1cm	17.0	12.0
Cirrhosis	No	4.0	0.0
	Yes	65.0	32.0
	Yes	2.0	1.0

Table 3: Adhesiolysis

Adhesiolysis			
		No	Yes
First Episode	No	8.0	67.0
	Yes	3.0	22.0
Repeated Attacks	No	3.0	22.0
	Yes	8.0	67.0
H/o Upper Abd Surgery	No	11.0	85.0
	Yes	0.0	4.0
Post ERCP	No	10.0	79.0
	Yes	1.0	10.0
BMI	<30	10.0	85.0
	>30	1.0	4.0
Upper Abdominal Scars/hernias	No	10.0	82.0
	Yes	1.0	7.0
Elevated TLC	No	10.0	71.0
	Yes	1.0	18.0
Abnormal LFT	No	10.0	80.0
	Yes	1.0	9.0
Elevated Amylase	No	11.0	82.0
	Yes	0.0	7.0
Gall Bladder Size	Contracted	0.0	9.0
	Distended	5.0	37.0
	Normal	6.0	43.0
Pericholecystic Fluid	No	11.0	83.0
	Yes	0.0	6.0
Peri-pancreatic Fluid	No	11.0	88.0

	Yes	0.0	1.0
Mutiple Stones	No	7.0	41.0
	Yes	4.0	48.0
Stone Size	<1cm	7.0	60.0
	>1cm	3.0	26.0
	No	1.0	3.0
Cirrhiosis	No	11.0	86.0
	Yes	0.0	3.0

Table 4: Duct Clipping

Duct Clipping			
		No	Yes
First Episode	No	67.0	8.0
	Yes	24.0	1.0
Repeated Attacks	No	24.0	1.0
	Yes	67.0	8.0
H/o Upper Abd Surgery	No	88.0	8.0
	Yes	3.0	1.0
Post ERCP	No	83.0	6.0
	Yes	8.0	3.0
BMI	<30	86.0	9.0
	>30	5.0	0.0
Upper Abdominal Scars/hernias	No	85.0	7.0
	Yes	6.0	2.0
Elevated TLC	No	72.0	9.0
	Yes	19.0	0.0
Abnormal LFT	No	82.0	8.0
	Yes	9.0	1.0
Elevated Amylase	No	85.0	8.0
	Yes	6.0	1.0
Gall Bladder Size	Contracted	7.0	2.0
	Distended	39.0	3.0
	Normal	45.0	4.0
Pericholecystic Fluid	No	85.0	9.0
	Yes	6.0	0.0
Peri-pancreatic Fluid	No	90.0	9.0
	Yes	1.0	0.0
Mutiple Stones	No	42.0	6.0
	Yes	49.0	3.0
Stone Size	<1cm	61.0	6.0
	>1cm	26.0	3.0
	No	4.0	0.0
Cirrhiosis	No	89.0	8.0
	Yes	2.0	1.0

Table 5: Extra Port

Extra Port			
		No	Yes
First Episode	No	74.0	1.0
	Yes	25.0	0.0
Repeated Attacks	No	25.0	0.0
	Yes	74.0	1.0
H/o Upper Abd Surgery	No	96.0	0.0
	Yes	3.0	1.0
Post ERCP	No	88.0	1.0
	Yes	11.0	0.0
BMI	<30	94.0	1.0
	>30	5.0	0.0
Upper Abdominal Scars/hernias	No	92.0	0.0
	Yes	7.0	1.0
Elevated TLC	No	80.0	1.0
	Yes	19.0	0.0
Abnormal LFT	No	89.0	1.0
	Yes	10.0	0.0
Elevated Amylase	No	92.0	1.0
	Yes	7.0	0.0

Gall Bladder Size	Contracted	9.0	0.0
	Distended	42.0	0.0
	Normal	48.0	1.0
Pericholecystic Fluid	No	93.0	1.0
	Yes	6.0	0.0
Peri-pancreatic Fluid	No	98.0	1.0
	Yes	1.0	0.0
Multiple Stones	No	47.0	1.0
	Yes	52.0	0.0
Stone Size	<1cm	67.0	0.0
	>1cm	28.0	1.0
Cirrhosis	No	4.0	0.0
	Yes	96.0	1.0

Discussion

Umbilical Port Entry

Difficult umbilical port entry was associated preoperatively with previous history of upper abdominal surgeries (100%) BMI more than 30(90%) and presence of upper abdominal scars/hernias (84%). On ultrasonography, the presence of multiple stones (15.7%) and cirrhosis of liver (33.3%) observed as predictors. Intraoperative presence of adhesions (15%) ductal anomaly (25%) and intra-op bleeding (23%) was significantly associated.

Obesity and the presence of abdominal fat make obvious difficulty in the insertion of the umbilical port as the fascia. Nanchani *et al.* [7] and Hussain *et al.* [8] have found BMI>30 to be significantly with difficulty in umbilical port entry and achieving pneumoperitoneum.

Upper abdominal operation and any upper abdominal scars or hernias indicators of previous upper abdominal surgeries can cause intra-abdominal adhesions that may lead to increases chances of injury and bleeding while placement of umbilical port.

Shannon *et al.* [9] have found that the presence of upper abdominal operations and presence of upper abdominal scars or hernias as being significantly associated with difficulty in umbilical port insertion.

Gall Bladder Grasping

Difficulty in gall bladder grasping can be associated significantly with contracted gallbladder (94.7%) Distended gallbladder (75.5%) and stones >1 cm (54.9%) on ultrasound.

A distended gallbladder or a gallbladder files with stones is difficult grasp because it tends to slip. Presence of inflammation gall bladder makes the wall friable and edematous thus posing problems to grasping.

Singh *et al.* [10] in their study have found significant association of gall bladder grasping difficulty with distended gallbladder and pericholecystic inflammation.

Lal *et al.* [9] identified that presence of big stones in the gall bladder neck lead to distention and difficulty in grasping.

Adhesiolysis with Calots Triangle Dissection

Preoperatively the need of adhesiolysis was heralded by, deranged LFT (23.5%) elevated amylase (100%), age >66(91%) male (66%) if it is presence of contracted of gall bladder (91%) multiple GB stones (66%) on ultrasound. Anomalies (78%) and bleeding (90%) on table was also predictive of difficulty.

Calot's triangle difficulty is related with; age >65 (88%) male sex (68%) history of previous attacks (64%) post ERCP(97.6%) abnormal LFT(96%) increased amylase (100%) contracts gallbladder (99%) presence of per-pancreatic fluid (100%) presence of many stones (66.3%) presence of cirrhosis on ultrasound (100%).

Increasing age is related with an increases chances of multiple attacks of cholecystitis and also increase frequency of upper abdominal operation. Therefore there is increase incidence of fibroses and adhesions in the hepatic hilum. Randhawa *et al.* [11] found that age more than 50 years is related with the difficulties similarly western studies in the past have implicated greater than 65 years with difficulty in Calot's dissection and adhesiolysis.

Our results were in similarity with Nanchani, Supe *et al.* [7] who have proposes that males is associated with more intense inflammation and fibrosis resulting in thick adhesions thus more difficult dissection.

Similarly history of repeated attacks, post ERCP status, causes difficulty in dissection of the calot's and significant predictor of difficulty in dissection of the Calot's triangle and adhesiolysis.

Elevated amylase signifies ongoing hepatitis, cholangitis and pancreatitis that poses difficulty in dissection due to edema and increase bleeding Alphonat *et al.* and Kama *et al.* in their study have demonstrated a similar association in their study. They have also obtains elevated TLC as a predictor for

difficulty but the same association was not obtained in our study probably because of higher cut off values of elevated TLC in our study^[12].

Duct and Artery Clipping

Difficulty in duct clipping is associated with history of upper abdomen surgery, post ERCP (26.8%) presence of upper abdomen scars/hernia (28%) at preoperative evaluation. The presence of cirrhosis on ultrasound (33.3%).

Upper abdominal surgeries and cirrhotic liver leads to significant fibrosis and abdominal distortion in the area. In this situation it is difficult to identify and delineate the cystic and artery. Thus there is difficulty in clipping these structures.

“The presence of arterial and or ductal anomalies leads to obvious difficulty in artery clipping. Also the presence of intraoperative bleeding obscures visibility and thus makes dissection difficult.

Extra Port

Use of extra port was associated only with presence of ductal anomalies (5.6%). This is probably because the presence of ductal anomaly necessitated a better exposure of the Calot's triangle thus the need to put an extra port. However only 2 incidence of the extra port placement were seen and definitive conclusions cannot be drawn. A study done by Khan *et al.* showed that extra ports were used to retract the abdominal viscera.

Drain

Use of drain was significantly associated with age>65 (63.6%) male sex (44.4%) history of previous upper abdomen surgeries (75%) post ERCP (63.4%) cirrhosis of liver on ultrasonography (77.8%) non visualized gall bladder (62.2%) inflamed gall bladder (51.3%) presence of intra peritoneal adhesions(54.5%) presence of ductal anomalies (52.8%) intra operative bleeding(66.7%) and cirrhosis liver (66.7%).

According to contini *et al.* the indication of drain placement with a worry about a biliary or hemorrhage from gall bladder bed. Thus situation associated with difficulty in dissection also are associated with the use of drain. This may not be associated independently with the above predictors^[13].

Sutures

Among the preoperative predictors the use of sutured to ligate cystic duct was associated with history of previous upper abdomen surgery (25%) post ERCP (22%) presence upper abdomen scars/hernia (16%). The presence of prep al ancrtic fluid (28.6%) cirrhosis on ultrasound(22.2%) was also associated anomalies (47.2%) arterial anomalies (20%) intra operative bleeding (23.3%) cirrhosis liver(25%) intraperitoneal adhesions(8%) and contracted gall bladder (15.4%) predicted difficulty.

The presence of history of upper abdominal surgeries or scars/ hernia in the upper abdomen is an indicator of pericholecystic fibrosis and possibly distorted anatomy. Similarly intra peritoneal adhesions are associated with intra peritoneal inflammatory process.

Indications of ERCP in patients undergoing subsequent cholecystectomies are usually biliary pancreatitis choledocholithiasis with or cholangitis etc. That are again associated with inflammation in the region.

Similarly cirrhosis is associated with hepatic Fibrosis and distortion of the anatomy Peripancreatic fluid is an evidence of pancreatitis that causes severe local inflammation.

Intra operative bleeding causes difficulty in identification of the structures in the hepatic hilum.

In these setting of fibrosis and distorted anatomy there may be distortion of the cystic duct and artery making them difficult to clamp. Therefore sutured or end loops may have to be used instead.

Gall Bladder Extraction

Difficulty in gall bladder extraction was associated with distended gall bladder (9.6%) and presence end multiple stones (5.8%). A distended gall bladder or the presence of many stones leads to difficulty in the extraction of the specimen the epigastria port and the increase probability of gall bladder perforation during these manoeuvres^[14].

Conclusion

- Elderly patients are predisposed to have a difficult laparoscopic cholecystectomy.
- Laparoscopic cholecystectomy is more commonly done in females however, the rate of difficult cases is observed to be higher in males.
- Recurrent cholecystitis is a predictor
- Obese patients and patients with uncontrolled diabetes are more prone for difficult laparoscopic cholecystectomy.
- Previous surgery predisposes towards difficulties in cholecystectomy.
- Patients who underwent ERCP pre operatively had more chances of having a difficult cholecystectomy

- Abnormal liver function tests and pancreatic enzyme profiles were associated with difficulty in surgery.
- Preoperative abdominal sonography has been observed as one of the diagnostic tool in predicting the difficulties during laparoscopic cholecystectomy.
- Features like distended or contracted gall bladder, intra-peritoneal adhesions, anatomical abnormalities and the presence of a parenchymal liver disease are signs that are associated with subsequent difficulties during the procedure.

Finally it can be concluded that laparoscopic cholecystectomy is gold standard for cholecystectomy in the present era. Definite predictors have been constituted that can caution the surgeon to be vigilant towards specific difficulties during the procedure. Knowledge of these predictors and their identification will enable the surgeon in providing a safer and more predictable outcome in this surgery.

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