

EVALUATION OF THE COMPLICATIONS OF LAPAROSCOPIC CHOLECYSTECTOMY IN ELECTIVE AND EMERGENCY CASES: AN APPLICATION OF CLAVIEN-DINDO CLASSIFICATION FOR RISK STRATIFICATION

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Abstract

Background: Cholecystectomy, the surgical removal of the gallbladder, has traditionally been performed using open surgical techniques. With the advent of minimally invasive surgery, laparoscopic cholecystectomy has gained widespread acceptance for its reduced post-operative pain, shorter hospital stay, and quicker recovery. The aim of this study was to evaluate the rate of complications and conversion to open surgery in elective and emergency cases of laparoscopic cholecystectomy, employing the Clavien-Dindo classification for risk stratification. **Materials and Methods:** A retrospective analysis of 197 laparoscopic cholecystectomy cases was performed, comprising 162 elective and 35 emergency surgeries. Complications were categorized using the Clavien-Dindo classification. Outcomes such as conversion rates, bile collection, common bile duct (CBD) injuries, port site infections, and other complications were assessed. **Result:** In the elective surgery group, only three cases (1.85%) were converted to open surgery due to obscured anatomy and bleeding. Minor complications were observed: post-operative bile collection in 2.4% of cases and a CBD injury in 0.61%. Port site infection occurred in 2.4% of elective cases. In emergency surgeries, one case (2.85%) required conversion to open surgery. Port site infection was reported in 5.71%, and sub-hepatic collection in 8.57% of emergency cases. No instances of liver injury, intestinal injury, peritonitis, or hernia were recorded. Anesthesia complications were not included in this study. **Conclusion:** The study indicates a low rate of conversion to open surgery and complications in both elective and emergency laparoscopic cholecystectomies. The Clavien-Dindo classification proved to be an effective tool for risk stratification, which accounts for patients' co-morbidities and the type of surgery performed. These findings suggest laparoscopic cholecystectomy as a relatively safe procedure but underscore the need for diligence in managing specific complications like CBD injury and port site infection.

INTRODUCTION

Minimally invasive surgery has been the mainstay of Gastrointestinal surgery nowadays. The majority of surgeries are being performed by the Laparoscopic method. Laparoscopic Cholecystectomy is a standard surgical procedure in most centres in our country and all over the World. Laparoscopic cholecystectomy has become the standard of care in managing symptomatic and selected asymptomatic

cholelithiasis. The proven advantages of the Laparoscopic approach over open methods are a short hospital stay, less postoperative pain, early recovery and back to work, decreased adhesion formation, lesser bleeding, shorter procedure duration, fewer complications, better cosmetic appearance, and overall cost-effectiveness. With extensive training and experience, severe complications like bile leak, bowel injury and vascular injuries have reduced. Still, complications following emergency cholecystectomy are higher than elective

cholecystectomy due to infection, inflammation, friability, adhesions, and obscured anatomy. We are showing the comparative study of our complications following elective and emergency cholecystectomy. A clear understanding of anatomy, proper surgical procedure, adequate training, and good experience in Laparoscopic surgery shall reduce the rate and magnitude of complications. This is an eye-opener, especially for budding Laparoscopic Surgeons.

Aim and objectives:

To evaluate the complications of laparoscopic cholecystectomy in elective and emergency cases with the help of Clavien-dindo classification for risk stratification.

MATERIALS AND METHODS

This prospective comparative study was conducted in the Department of General Surgery, GITAM Institute of Medical Sciences and Research, GITAM (Deemed to be University), Visakhapatnam. The study period is four years, from February 2018 to February 2022. The study was done after getting approval from the Institutional Ethics Committee. Informed consent was also taken from patients before taking them into the study. The study population includes patients who underwent laparoscopic cholecystectomy either electively or on an emergency basis.

Inclusion Criteria

Patients suffering from symptomatic gallstone disease and selected asymptomatic gallstone disease patients.

Exclusion Criteria

The patients with absolute contra-indication for Laparoscopic cholecystectomy and those specifically interested in open surgery were excluded from the study. Absolute contraindications for laparoscopic cholecystectomy include an inability to tolerate general anaesthesia and uncontrolled coagulopathy. Patients with severe obstructive pulmonary disease or congestive heart failure (e.g., cardiac ejection fraction <20%) may not abide by carbon dioxide pneumoperitoneum and be better served with open cholecystectomy.

Preoperative necessary investigations were done in all the cases. They are complete blood counts, fasting blood glucose, renal function tests, liver function tests, and ultrasound abdomen scans. Chest X-ray, ECG, and Echocardiogram were done for patients over 40 years and those suffering from co-morbid conditions. Those patients suffering from co-morbid conditions were treated adequately by the respective Physicians and then taken up for elective Laparoscopic surgery. Emergency cases were taken up for the surgery under the supervision of a treating Physician. The pre-anaesthetic assessment was done in all the cases. Each patient and their close relatives were explained about the procedure and possible complications that can be encountered during surgery, and written informed consent was taken.

High risks of anaesthesia and surgery were described in emergency cases in detail and informed high-risk consents were obtained.

RESULTS

The total number of symptomatic and selected asymptomatic gallstone disease cases operated on during the study period by the Laparoscopic method was 197. The number of cases operated each year from 2018 to 2022 is shown in [Figure 1]. Out of this, 162 (82%) performed elective surgery, and 35 (18%) were operated on an emergency basis. This data is represented in [Figure 1].

Laparoscopic cholecystectomy is being carried in a supine position under General anaesthesia. Our Laparoscopic Surgery unit in the operation theatre is well equipped with all Laparoscopic surgical instruments of Karl Storz make, electro-cautery unit, endoscopic suction-irrigation system, and anaesthetic equipment. All elective cases were put on antibiotics for 24 hours only. However, emergency cases were treated with higher antibiotics and other medicines as per the need for five days minimum. Standard Surgical techniques were adopted. Routine postoperative advice was given to all in their discharge summary after explaining them. Patients were followed up for a minimum of 6 months after the surgery. Typically, patients attended the respective outpatient department at 15- to 30-day intervals. However, during the COVID pandemic, they were followed up by telephone conversations or video consultations. They were instructed to report any complications.

Demography in Elective Surgery: In the Elective surgical group, which included 162 patients, 153 (94.44%) were females, and 9 (5.56%) were males. The age distribution of cases is indicated as below. It showed that most patients were aged 30 to 40 years, followed by 40 to 60 years. We have also operated on 5 cases between 10 to 19 years. This demographic data is represented in [Figure 3].

Co-morbidities: Out of 162 elective cases, 35 patients (21.59%) had one or other co-morbid conditions. 21 patients (12.96%) had Type II diabetes mellitus, 9 patients (5.55%) had hypertension, 5 patients (3.08%) had chronic obstructive pulmonary disease. This information is shown in [Figure 4].

Out of 162, three (1.85%) were converted to the open method. One (0.61%) case was converted to the open method for obscured anatomy, and two (1.23%) patients were converted to open due to bleeding and obscured anatomy.

Demography in Emergency cases: This group included 35 cases, most of which fall into the 30 to 60 age group. Twenty-nine (82.85%) subjects were female, and six (17.15%) were male.

Co-morbidities: Out of 35 cases, ten (28.57%) patients had Type II diabetes mellitus, 6 (17.14%) patients had hypertension, and 3 (8.57%) patients had chronic obstructive pulmonary disease.

In the emergency group, 19 (54.28%) cases were suffering from acute cholecystitis, 7 (20%) patients had empyema of the gall bladder, 8 (22.85%) subjects had mucocele of the gall bladder, and 1 (2.85%) case had gangrenous gall bladder. This data is depicted in [Figure 5].

Complications in elective cases: The Clavien-Dindo classification has been developed and validated in elective general surgical patients. Very few complications were encountered in our series. Four (2.4%) cases had postoperative bile collection. All these four subjects had obscured anatomy due to dense adhesions from the previous infection. One (0.61%) of these patients had common bile duct injury. Bile was collected from the liver bed in the other two (1.23%) cases. One point (0.61%) of bilioma was due to the sling of a clip from the cystic duct. Four (2.4%) cases developed port site infection. Endoscopic Retrograde Cholangiopancreatography (ERCP) followed by stenting was done for common bile duct injury. Two patients (1.23%) recovered by conservative treatment. The reopening was done for the one (0.61%) who did not recover. It was found

that the cystic duct clip had slipped. The peritoneal toilet had been done, and the cystic duct was ligated.

Emergency cases: Out of 35, one (2.85%) case was converted to the open method due to difficult dissection and obscured anatomy.

Complications in emergency cases: Even in emergencies, only very few complications were encountered in our series. Port site infection was seen in two (5.71%) cases, and sub-hepatic collection was discovered in three (8.57%) cases. Two subhepatic collection (8.57%) cases were empyema of gall bladder, and one (2.85%) case was gangrenous gall bladder. All the three (8.57%) cases have recovered with treatment.

The Clavien-Dindo classification of surgical complications has been used in emergency surgical patients, but preoperative organ dysfunctions have been considered when defining postoperative grade IV complications. Patients' co-morbidities and the type of surgery have been considered for risk stratification.

We did not encounter complications like liver injury, intestinal injury, peritonitis, or hernia. Spilt gallstones were discovered in 7 (20%) cases.

Table 1: Overall Laparoscopic Surgery Cases (2018-2022)

| Category | Number of Cases | Percentage (%) |
|------------------|-----------------|----------------|
| Total Cases | 197 | 100 |
| Elective Surgery | 162 | 82 |
| Emergency Cases | 35 | 18 |

Table 2: Demographics in Elective Surgery Cases

| Parameter | Number of Cases | Percentage (%) |
|-----------------|-----------------|----------------|
| Total Cases | 162 | 100 |
| Female Patients | 153 | 94.44 |
| Male Patients | 9 | 5.56 |

Table 3: Co-morbidities in Elective Cases

| Co-morbidity | Number of Cases | Percentage (%) |
|---------------------------------------|-----------------|----------------|
| Type II Diabetes Mellitus | 21 | 12.96 |
| Hypertension | 9 | 5.55 |
| Chronic Obstructive Pulmonary Disease | 5 | 3.08 |

Table 4: Complications in Elective Cases

| Complication | Number of Cases | Percentage (%) |
|-------------------------|-----------------|----------------|
| Bile Collection | 4 | 2.4 |
| Common Bile Duct Injury | 1 | 0.61 |
| Port Site Infection | 4 | 2.4 |

Table 5: Demographics in Emergency Cases

| Parameter | Number of Cases | Percentage (%) |
|-----------------|-----------------|----------------|
| Total Cases | 35 | 100 |
| Female Patients | 29 | 82.85 |
| Male Patients | 6 | 17.15 |

Table 6: Co-morbidities in Emergency Cases

| Co-morbidity | Number of Cases | Percentage (%) |
|---------------------------------------|-----------------|----------------|
| Type II Diabetes Mellitus | 10 | 28.57 |
| Hypertension | 6 | 17.14 |
| Chronic Obstructive Pulmonary Disease | 3 | 8.57 |

Table 7: Complications in Emergency Cases

| Complication | Number of Cases | Percentage (%) |
|------------------------|-----------------|----------------|
| Port Site Infection | 2 | 5.71 |
| Sub-hepatic Collection | 3 | 8.57 |

DISCUSSION

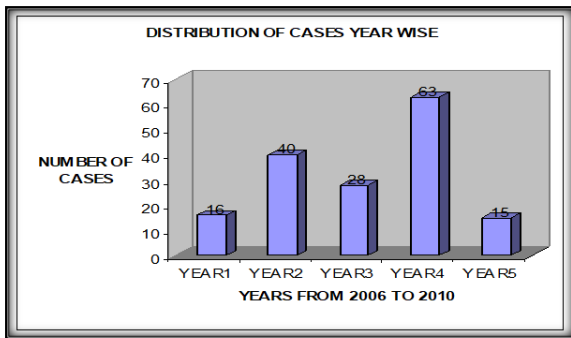


Figure 1: Year 1: 2016, Year 2: 2017, Year 3: 2018, Year 4: 2019, Year 5: 2020. Year wise cases of elective cholecystectomy

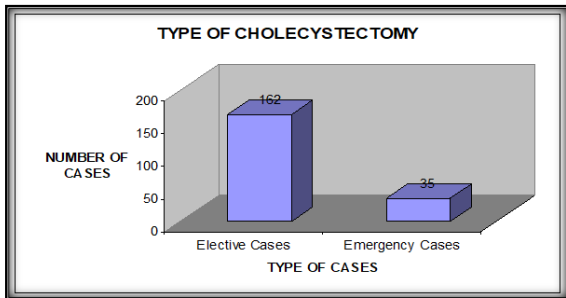


Figure 2: Types of Cholecystectomy

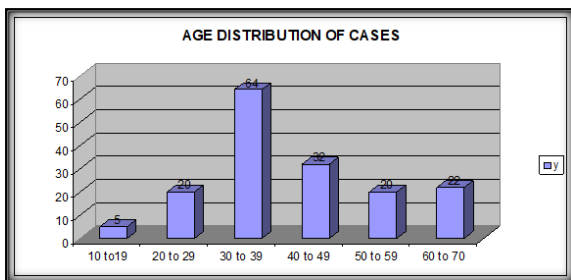


Figure 3: Age distribution of elective cases

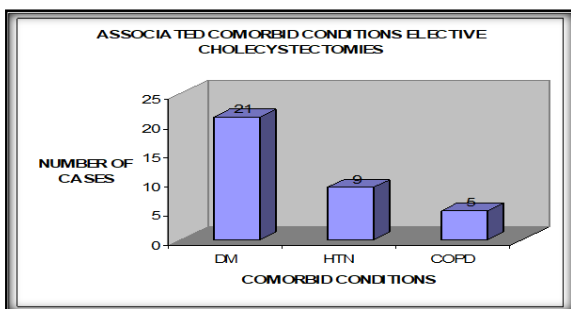


Figure 4: Associated co-morbid conditions in elective cases.

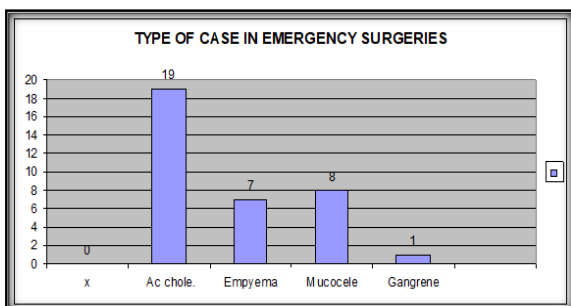


Figure 5: Type of cases operated in emergency

Laparoscopic Cholecystectomy is one of the most frequently performed laparoscopic operations. It has a low rate of mortality and morbidity. Laparoscopic Cholecystectomy is a safe and effective procedure in almost all patients with cholelithiasis. Most of the complications are due to a lack of experience or lack of knowledge of typical errors. A rational selection of patients, proper preoperative workup, understanding of possible complications, and a low threshold for conversion, combined with adequate training, make this operation a safe procedure with favourable results.^[1]

Laparoscopic surgery has been the gold standard procedure for gall bladder surgeries all over the World. Complications do occur with any surgical methods. Similarly, complications were higher at the beginning of Laparoscopic surgical inception. However, nowadays, the complication and conversion rates have drastically declined with good surgical skills and well-advanced equipment.^[2,3]

Despite numerous recent technical advances in minimally invasive surgical techniques, the potential risk remains for severe morbidity during initial laparoscopic access. Safe access depends on adhering to well-recognized trocar insertion principles, knowledge of abdominal anatomy, and recognition of hazards imposed by previous surgery. Trocar use requires considerable training, practice, skill, manual dexterity, adequate muscular strength, knowledge of the associated risks, and careful patient selection. Debate continues over the protection provided by fail-safe features in preventing trocar-related injury (shields, optical trocars, radially expanding designs or open method). Due to their unique design and use issues, trocars with these features may require additional training, knowledge, or skill.^[4]

An extensive series of Laparoscopic Cholecystectomies performed by S Duca et al. at the Training Centre of the Romanian laparoscopic surgery, where they reviewed 9542 cases in a retrospective study, showed a complication rate of 2.9 %, with intra-operative haemorrhage in 2.3 % cases, bile duct injury in 0.1 % cases. Their conversion rate was 1.9%, which includes obligatory and elective conversions.^[5]

R.K. Mishra at World Laparoscopy Hospital, India, an advanced teaching Laparoscopic centre, recorded an incidence of Iatrogenic common bile duct injury of 0.12% and 0.55% during open and laparoscopic cholecystectomy, respectively.^[6]

In 1991, Hunter proposed a 5-step approach to prevent the high rate of biliary injury in the United States. Hunter noted that Bile duct injuries with laparoscopic cholecystectomy appeared more common in the US (0.5 to 2.7%) than in Europe (0.33%).

The Guidelines for the clinical application of laparoscopic biliary tract surgery by the Society of American Gastrointestinal Endoscopic Surgeons are

based, in turn, on an essential 1991 publication by Hunter, who described the steps a surgeon must take to avoid dreadful complications. The guidelines require the surgeons to adhere to the following steps:

- The surgeon must identify the cystic duct at its junction with the gall bladder.
- The surgeon should retract the gallbladder infundibulum laterally rather than in the cephalad direction.
- The surgeon should meticulously dissect the cystic duct and cystic artery.
- The surgeon should limit all energy sources near the Common Bile Duct and recognize that they can cause occult injury.
- The surgeon should use operative cholangiography liberally to discover surgically significant anomalies, clarify complicated anatomy and detect common bile duct stones.
- The surgeon should not hesitate to convert to an open operation for technical difficulties, anatomic uncertainties, or anatomic anomalies, especially in cases of acute cholecystitis.
- The surgeon needs to see all structures clearly before dividing any ductal structures.^[7]

Retrospectively analyzed medical records of 740 patients diagnosed with cholelithiasis and had laparoscopic cholecystectomy in the General Hospital in Berane, Montenegro, between 2005 and 2014.

Miodrag Radunovic et al., In their study, there were 70 patients (9.45%) with postoperative complications. The most common postoperative complications were bleeding from the abdominal cavity of more than 100 ml/24h (in 27 patients or 3.64%), and bile leaks through the drain > 50-100 ml/24h (14 patients, or 1.89%). Less frequent complications were surgical wound infection (7 patients, or 0.94%), incisional hernia at the place of port (3 patients, or 0.40%), and intra-abdominal abscess caused by residual calculus in the abdominal cavity (2 patients, or 0.27%).^[8]

Danny A Sherwinter et al., updated in Medscape: Major common bile duct injuries, though infrequent (0.24%), can be devastating when they do occur. Repairs for such damages range from primary repair over a stent to choledocho-enterostomy. The tricks mentioned above can help the surgeon avoid this potentially serious complication.^[9]

A study carried out by Anshuman Aashu et al. in IPGME and R and SSKM hospital, Kolkata, Eastern India, performed Laparoscopic cholecystectomy in 750 cases. Showed total of 493 complications occurred in 483 patients (64.4%). The most common complication was port-site infection in 476 patients (63.5%). The other complications included bleeding (1.2%), bowel injury (0.7%) and bile duct injury (0.4%). Mortality occurred in 3 cases (0.4%). This incidence is comparatively higher.^[10]

CONCLUSION

Laparoscopic surgery is a standard surgical procedure method for gallstone diseases. Several complications have been encountered in different series. However, the incidence steadily declined as more and more experience gained in laparoscopic surgery. The learning curve has done considerable damage initially, but nowadays, it has drastically reduced with good training and experience.^[11]

Elective cases constituted five times of emergency cases. In our series, females dominated. Most cases fell into the age group of 30 to 40 years. Operation time was much less than the open surgical method. Irrespective of associated co-morbid conditions in many cases, our study showed a significantly lower incidence of complications. Even in emergencies, the Laparoscopic procedure has a good stand in the present scenario. Our conversion rate is also shallow. Hence, the Laparoscopic procedure for elective and emergency cases is the gold standard. It needs good trained skills and experience in Laparoscopic surgeries, adequate equipment, and facilities.

Even for emergency cholecystectomy, Laparoscopic surgery is the best option and is associated with fewer complications than an open procedure, as is seen in our series. Only obscured anatomy remained the main indication for conversion in our series.

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