Laparoscopic Cholecystectomy: Analysis of 619 Consecutive Cases in a Caribbean Setting

Dilip V. Dan, MBBS, FACS; Dave Harnanan, MBBS; Ravi Maharaj, MBBS, FRCS; Shiva Seetahal, MBBS; Yardesh Singh, MBBS; Vijay Naraynsingh, MBBS, FRCS, FACS

Introduction: Laparoscopic cholecystectomy has become the gold standard in the definitive treatment of symptomatic gall bladder disease. It boasts superior morbidity and mortality and lower complication rates than open approaches.

Aim: This study outlines the experiences associated with 619 laparoscopic cholecystectomies performed in Trinidad.

Methods: The records of 619 consecutive patients who underwent the procedure were reviewed. All cases were either performed or supervised by the senior author. The population comprised 511 females and 108 males. The average age was 48.5 years.

Results: The commonest indications for surgery were symptomatic cholelithiasis (380 cases) and acute cholecystitis (111 cases). The mean operating time was 34 minutes. The mean length of stay on the ward was 17.45 hours. Mortality was zero. Only 4 cases were converted to open procedures. The commonest postoperative complication was wound-infection.

Conclusion: In summary, this study demonstrates that laparoscopic cholecystectomy can be performed safely in a Third World setting with results comparable to those internationally.

Keywords: gallbladder ■ surgery

Author Affiliations: Department of General Surgery, San Fernando General Hospital (Messrs Dan, Harnanan, Maharaj, Seetahal, and Singh) and University of the West Indies, St Augustine Campus (Messrs Dan, Maharaj, and Naraynsingh).
Corresponding Author: Dilip V. Dan, MBBS, FACS, s#26 London St, St Joseph Village, San Fernando, Trinidad (dilipdan@hotmail.com).

INTRODUCTION

Laparoscopic cholecystectomy (LC) was initially performed by a German surgeon, Erich Muhe, in 1985 and made popular in 1988 by Reddick et al.[1] Since then, LC has become the standard of care for symptomatic gallbladder disease. The benefits of LC have been well documented and, as the experience and dexterity with the procedure grow, morbidity and mortality will be further reduced.

The first LC to be performed in the English-speaking Caribbean took place at a private hospital in Trinidad and Tobago in 1991.[2] The acceptance of laparoscopic surgery as an effective tool in the surgeon's armamentarium has been gradual in Trinidad and Tobago. In 2002, only 4% of the total (public and private) number of cholecystectomies were done laparoscopically, as cholecystectomies were being performed primarily via the open or "mini-lap" techniques.[3] However, LC has been performed and is still done successfully in other Caribbean territories, ie, Jamaica and Barbados.

A laparoscopic surgery service was introduced to San Fernando General Hospital in July 2003 and, since then, 267 LCs have been performed at the public hospital and 352 privately. In this article, we present our experience with 619 consecutive cases of LC done in a Caribbean setting over the period July 2003 to July 2007.

METHODOLOGY

In 2003, a laparoscopic unit, which conducted both open and laparoscopic procedures, was introduced to the surgical department at San Fernando General Hospital. From July 2003 to July 2007, a total of 267 LCs were performed. The majority of cases were performed by a single surgeon (D.V.D.) with the remainder having been conducted by surgical residents. Difficult cases initiated by the residents were completed by the senior author (D.V.D.).

The number of cases done in the private sector has also risen. From July 2003 to July 2007, a total of 352 LCs were performed by the senior author (D.V.D.). The cases were performed at various private institutions in Trinidad. In some cases, concomitant procedures were performed with the cholecystectomy, ie, laparoscopic gastric bypass surgery, Nissen funduplication, hernia repairs, and colon resection.

All patients were admitted on the morning of surgery, unless the individual had comorbidities that necessitated earlier admission. Preoperative counseling of the patients, who were given preoperative instruction sheets on screening, was done in the outpatient clinic. Preoperative hemotological and biochemical blood investigations and abdominal ultrasounds were routinely performed with additional chest radiograph and

electrocardiographs for all patients older than 40 years of age. Elevated liver enzymes, ultrasound evidence of common bile duct dilatation, or jaundice were addressed by preoperative endoscopic retrograde cholangio-pancreatography (ERCP) with stone extraction where indicated.

The procedure was performed with the standard 4-port technique using 15 mm Hg of CO_2 pneumoperitoneum. In all of the cases, the pneumoperitoneum was created via an open Hassan port technique.

One 10-/12-mm ports and two 5-mm ports were placed under direct vision. The working ports were both placed in the left abdomen and the retracting port in the right lateral abdomen. The operating surgeon controlled the left-sided instruments. The camera was operated through the supraumbilical port and the gallbladder was retrieved via this port.

The majority of cases (99%) were performed with the use of the harmonic scalpel (Ethicon). Three cases were done with electrocautery due to malfunctioning of the ultrasound generator. Most of the cholecystectomies were performed via a retrograde approach with the initial dissection beginning at Calot's triangle and the dome-down approach used only in difficult cases where the anatomy was obscured. In difficult cases, a subtotal cholecystectomy was performed in which the Hartman's pouch was transected with the use of endoscopic staplers. In all other cases, the cystic duct was clipped and transected. In more than 50% of these cases, the cystic artery was taken with the harmonic scalpel, and in the other cases the cystic artery was controlled by the use of clips.

In the minority of cases, where perforation of the gallbladder occurred or severe infection was present, an Endo-pouch retrieval bag was used to remove the gallbladder from the supraumbilical port. Active suction drains were left in situ in selected cases of acute cholecystitis or empyema, and these drains were removed on day 1 post op.

The patients were given 2 doses of diclofenac injections and oral analgesics post operatively and on discharge. Parenteral prokinetic agents (metoclopromide) were given routinely in the postoperative period to reduce the incidence of postoperative nausea and vomiting.

Criteria for discharge included (1) adequate pain control, (2) ability to tolerate a light diet, (3) ability to ambulate and (4) ability to void urine. These criteria were easily achieved at the private institutions and the majority of patients were discharged within 6 to 8 hours. However, at the public hospital, it was difficult to optimize patients for discharge mainly due to inadequate nursing staff.

Data were collected retrospectively from patients' notes for all patients who had LC, both in private and public hospitals, from the period July 2003 to July 2007. Demographic data, indications for operation, severity classification, operative time, length of stay, and complications were collected. Indications for LC were broadly grouped into the categories as shown in Table 1.

Operative time was calculated from the insertion of the first port to skin closure of the last port. In cases where the LC was performed with another procedure, the cholecystectomy was performed first and the time calculated from the insertion of the first port to the completion of the cholecystectomy. Length of stay was calculated from the time of admission to the time of discharge. Discharge time was approximated to the nearest hour. At the time of surgery, the gallbladder was categorized as class I, II, III, or IV, depending on the degree of difficulty encountered in defining the gallbladder and the associated anatomy. The gallbladder was defined as class I when the anatomy was clear, class II when the anatomy was discernible after initial dissection, class III when the anatomy was discernible after assiduous dissection, and class IV when the anatomy was unclear and when Calot's triangle and other structures may have been impossible to identify. The data collected were compiled and analyzed.

RESULTS

Since January 2003, a total of 619 cases of LCs were performed by a single surgeon both in private (352) and public settings (267). The youngest patient was a 9-year-

Table 1. Indications for Cholecystectomy

Indication	No. of Cases	%
Symptomatic cholelithiasis	380	61
Acute cholecystitis	111	18
Acute/chronic cholecystitis	100	16
Empyema gallbladder	12	2
Choledocholithiasis/biliary pancreatitis	5	1
Biliary dyskinesia	4	
Cancer of gallbladder/polyp	4	
Porcelain gallbladder	3	
Total	619	100

old girl with symptomatic gallstones secondary to sickle cell disease. The oldest patient in this study was a 92-year-old gentleman who presented with acute cholecystitis.

The average overall age was 48.5 years (SD = 16.9). Of the total population, females (511 patients) outnumbered males (108 patients; 83% vs 17%), showing a clear predominance of the female gender.

The indications for operation are as shown in Table 1. Three hundred eighty (61%) patients had LC because of symptomatic gallstones, 111 (18%) patients because of acute cholecystitis, and 100 (16%) patients because of acute-on-chronic cholecystitis.

The average overall operative time was 34 minutes. Once the cases were complicated with acute inflammatory changes, the average operating time increased so that the average operating time for the cases done for biliary dyskinesia was 26 minutes and the average operating time for cases done for empyema gallbladder was 48 minutes (Table 2).

A same-day discharge was achieved in 324 (52%) patients. The average length of stay for cases done in the private sector was 12 hours, compared to 23 hours in the public sector. The average overall length of stay was 17.45 hours. The patients with acute cholecystitis or empyema were not considered for same-day discharge. The length of stay was longer for those cases complicated by acute inflammatory changes (Table 3).

The severity classification was used to determine the difficulty in performing the procedure and was a subjective measure of severity. Seventy-seven percent of the cases were of the class 2, with classes 3 and 4 accounting for 12% and 4%, respectively. Sixty-seven percent of males were of class 2 severity, and 22% and 6% were of class 3 and 4 severity. Eighty percent of women who had LC were of class 2 severity, with classes 3 and 4 accounting for 10% and 3%, respectively. As the severity score increased so did the operative time, with the average operative time for a class 1 being 32.83 minutes and that for a class 4 being 50.50 minutes (Table 4).

There were 4 conversions to open cholecystectomy overall, mainly for difficult dissection and abnormal anatomy. Major complications included 1 case of cystic duct leakage and 2 cases of bleeding cystic arteries. Six patients developed umbilical port hernias. The port site most prone to wound sepsis was the umbilical port and wound sepsis accounted for 4% (25 cases) of the total patient population.

There were 3 cases of retained stones, all of which underwent ERCP with sphincterotomy and stone extraction. There were no cases of common bile duct injury. A leak from the duct of Luschka is a recognized complication, but this was not encountered in our population, probably due to the meticulous dissection of the gallbladder bed with the harmonic scalpel. There were no procedure-related deaths.

DISCUSSION

LC has evolved to be the standard of care for the management of symptomatic gall bladder disease and has been well accepted as the most effective and safe procedure for the treatment of symptomatic gallstones.[4] Since the first LC was performed in 1985, this surgical method has gained much popularity and has taken the surgical community by storm. It has been well documented that cholecystectomy done laparoscopically has been associated with decreased morbidity, decreased analgesic requirement, decreased hospital stay, superior cosmesis, and earlier return to normal function.[5] On average, the patients return to normal function within 1 week and patient satisfaction is high.

As the surgeon's dexterity and technological advances with this surgical modality have improved over the years, operation time has decreased, associated complications have diminished, and the need for conversion to open cholecystectomy has also been reduced.[6] These advantages have fueled the rapid growth of laparoscopic surgery and have resulted in the dwindling of indications for open cholecystectomy.

Laparoscopic surgery has been well accepted in the international community. However, its introduction into the Caribbean community has been much more gradual. The delay in popularity of laparoscopic surgery was mainly influenced by the high initial equipment cost associated with this modality of surgery; however, the cost of LC was shown to be 18% less than for open conventional cholecystectomy, principally because of the shorter postoperative stay.[7,8]

Despite this and other factors hindering the introduction of laparoscopic surgery in the Caribbean medical fraternity, a laparoscopic unit was introduced in San Fernando General Hospital in July 2003. Since then, more than 267 LCs have been performed in this public hospital and more than 352 LCs have been done privately with minimal complication and conversion rates.

Strasberg et al, in 1999, thought that the incidence of complications were reduced but remained higher than open cholecystectomy, once the learning curve was overcome.[9] However, the outcome of LC done by supervised residents and surgeons was similar. This was clearly evident by our low complication and conversion rates.

As more experience is accrued, the classic contrain-

Table 2. Indications and Operative Time

Indications	Operative Time (Min)
Biliary dyskinesia	26.5
Symptomatic cholelithiasis	32.78
Acute-on-chronic cholecystitis	34.29
Choledocholithiasis/biliary pancreatitis	35.2
Acute cholecystitis	37.71
Empyema gall bladder	48.5

dications for LC are being abandoned, and more difficult cases are being done. LC has become the treatment of choice for symptomatic cholelithiasis, but controversy persists over the use of this approach in the treatment of acute cholecystitis. Even after LC became widely accepted for treating cholelithiasis, acute cholecystitis was still considered a relative contraindication because of the higher rates of perioperative complications recorded. Even though LC for acute and gangrenous cholecystitis is technically demanding, in experienced hands, it is safe and effective. It does not increase the mortality rate, and the morbidity rate seems to be even lower than that in open cholecystectomy. However, a moderately high conversion rate must be accepted.[10] Lo (1996) recommended emergent LC within 72 hours of onset of acute cholecystitis because it was associated with significantly fewer conversions (11% vs 23%), fewer complications (13% vs 29%) and fewer hospitalizations than interval cholecystectomy.[11] Lai noted that LC as early as 24 hours after the onset of acute cholecystitis did not increase complications or conversions.[12]

In our experience, earlier intervention for patients with acute cholecystitis resulted in a better overall outcome and earlier returns to normal function (18% of the study population). Nevertheless, LC is still reported as having a higher complication rate for acute cholecystitis with currently reported complication rate of 9% to 17%.[13,14] Fortunately, our complications were limited to superficial wound infections with no bile duct injuries. LC for acute cholecystitis was associated with increased operative time (37.71 minutes) and increased duration of stay (19.5 hours), but overall outcome and return to normal function was much better than open or interval cholecystectomy. There was an increased incidence of

class 4 cholecystectomies in patients who presented with acute cholecystitis and, in those cases where the anatomy was obscured, a subtotal cholecystectomy was performed with use of the endoscopic staplers.

The indications for LC are expanding rapidly so that there are relatively few contraindications. The only absolute contraindication to LC is a preoperative diagnosis of gallbladder carcinoma. Relative contraindications include acute cholangitis, portal hypertension, pregnancy, and bleeding diathesis. But this list is still evolving and will depend on the expertise of the surgical team.[15]

Conversions are more common in difficult cases, especially the class 4 cases; however, in our practice, a subtotal cholecystectomy was performed for those cases where the cholecystectomy was complicated by the presence of local factors that made the dissection of Calot's triangle difficult. These local factors included active inflammation and dense adhesions. As a result, our conversion rate was limited to 4 cases. These 4 cases were complicated by acute inflammation of the gallbladder, with 2 cases having empyema of the gallbladder and 2 cases having severe acute cholecystitis. The cases were all converted on the basis of difficult anatomy at Calot's triangle. These cases were safely done via the open approach with no complications, and the patients were discharged (on average) by day 4. General factors that are suggestive of technical difficulty include increased age, male gender, long symptomatic intervals, and greater number of acute attacks before LC.[15] The cases that were converted in this population were all middle aged, and 3 of the 4 patients were female.

The principle of performing a subtotal cholecystectomy in the complicated cases is an acceptable option and was performed in 10 cases of our total population. This approach has been clearly shown to decrease the conversion rate to less than 1%.[16] As experience with laparoscopic surgery advances, the need for conversion to open surgery will become negligible.

One of the other advantages of LC is the short operative time. Laparoscopic surgery has advanced tremendously over the years and the surgeon's expertise with this form of surgery, has also improved leaps and bounds. This has resulted in the average time to perform LC being reduced from 83 minutes in 2000 to 21 minutes in 2007.[17] On average, our overall operative time was 34.07 minutes.

One of the major advantages of LC vs open cholecystectomy is the reduction in hospital stay. Previous data have shown that the length of stay is twice as long for open cholecystectomy vs LC. In our study, the average length of stay was 17.45 hours. Fifty-two percent of the patients undergoing LC were suitable for same-day discharge. Actual discharge in 24 hours was achieved in 80% of the total population.

LC is accompanied by a definite risk of morbidity and mortality. Bile duct injuries appear to be a major problem, as their incidence during LC has been reported

Table 3. Indications and Length of Stay

Indications	Average Length of Stay, h
Biliary dyskinesia	11
Symptomatic cholelithiasis	17.26
Acute-on-chronic cholecystitis	15.26
Choledocholithiasis/biliary pancreatitis	18.4
Acute cholecystitis	19.53
Empyema gall bladder	27.5

Table 4. Severity Classification and Operative Time

Class	Average Time	No. of Cases
1	32.83	41
2	32.33	476
3	40.83	78
4	50.50	24
		619

Table 5. Complications and Management

Type of Complications in 619 Cases	No. of Patients	Management
Cystic duct/common duct injury	0	
Cystic duct leakage	1	Exploratory laparotomy and clip ligation of cystic duct
Accessory bile duct leakage	0	
Common bile duct stones—retained	3	Endoscopic retrograde cholangio-pancreatography and stone retrieval
Cystic artery bleed	2	Laparoscopy with clip ligation of cystic artery Exploratory laparotomy and ligation of cystic artery
Bleeding	1	Conservative
Pancreatitis	0	
Port site hernias	6	Surgical repair
Wound infection	25	Local therapy and antibiotics
Deep vein thrombosis	0	
Subdiaphragmatic fluid collection	0	

to be 2.5 to 4 times higher than with the traditional open technique.[18-21] Bile duct injury is the most feared complication of LC, and every effort should be made to prevent this dreadful complication. In our study population, there were no bile duct injuries. This has resulted from meticulous dissection of the safety zone (cystic duct–gallbladder junction) and avoidance of the danger zone (cystic duct–common duct junction) and the use of intra-operative cholangiogram in selected cases.

The major complications encountered in our population were cystic duct leakage (1 case) and the cystic artery bleeds (2 cases). Most of the other complications were minor and easily treated. The complication with the highest incidence was that of port site infection (25 patients), usually of the umbilical port. The literature reports the incidence of port site infections at less than 1%; in our study, the incidence was 4%.[22,23] Similarly, the literature reports the incidence of port site hernia rate as less than 0.5%; in our study, the incidence was 1%.[22,23] The former may be due to the choice of preoperative cleaning solution used, in which hibitane in alcohol was preferred to iodine. Iodine is now being used, and the outcomes are being monitored for further study.

The introduction and acceptance of laparoscopic surgery in the Caribbean setting has been a gradual process. Despite being successfully done in some Caribbean territories, the relative paucity of laparoscopic surgery in the Caribbean can be attributed to several factors. Firstly, the associated costs in establishing a laparoscopic unit are usually mitigating. Apart from the initial acquisition of the necessary equipment and instruments, the subsequent maintenance of this equipment presents fiduciary challenges to many institutions in the Caribbean setting. In addition, the training of personnel required for the efficient running of such units presents both economic and human resource challenges. Adequate interisland access is not available in the Caribbean, thus preventing the establishment of a tertiary laparoscopic center. Couple these difficulties with the

acceptance of more traditional surgical techniques and subtle resistance to any changes in the status quo, and it becomes apparent why laparoscopic surgery in not more widespread within the Caribbean.

CONCLUSION

LC has undoubtedly become the gold standard for the management of benign gallbladder disease. It is clearly superior to the open procedure in decreasing postoperative pain, in-hospital stay, cosmetic concerns, and time-to-normal function. This is the largest study to date reported in the Caribbean. This study clearly demonstrates that LCs can be done safely and efficiently in the Caribbean setting.

ACKNOWLEDGMENTS

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