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ORIGINAL ARTICLE

"Laparoscopic Cholecystectomy: A Single Surgeon's Experience in some of the Teaching Hospitals of West Bengal"

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Abstract Laparoscopic cholecystectomy has revolutionized the management of symptomatic gallstone disease since its introduction more than 20 years ago. It has gained widespread acceptance and is presently the gold standard for its management. This large study spanned over last 10 years and includes prospective data on 950 elective cases of laparoscopic cholecystectomy since 2002. All cases were operated personally by the author in different teaching hospitals of West Bengal. The following were looked into: profiles of the patients including major comorbidities requiring special precautions, the frequency of "difficult cholecystectomies," conversion rate, and operative and postoperative complications. The results showed that 75 % of the patients were females. The mean age of the female patients was 35 years (range15–75), while that of the male patients was 42 (range 18–68). Thirty-two patients had major comorbidities which required special precautions in the perioperative period. Twenty-six percent of the cases were categorized as "difficult," and 6 % of the cases had to be converted to open procedure. Major complications occurred in 11 patients of which five had to be converted. Fifty-five patients had port-site infection due to atypical mycobacteria species of which majority occurred in the last 1 year of the study. All of them responded to second-line antitubercular medications.

Keywords Laparoscopic cholecystectomy · "Difficult" laparoscopic cholecystectomy · Conversion · Complications · Port-site infection

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Introduction

Nowadays, laparoscopic cholecystectomy (LC) is one of the most common operations in general surgical units and is one of the most frequently performed laparoscopic procedures [1]. Symptomatic gallstone disease is the commonest indication for LC, and nearly 90 % of cholecystectomies are nowadays performed laparoscopically [2].

An open cholecystectomy may have to be resorted in patients with gallbladder mass or suspicion of gall bladder malignancy, late third trimester of pregnancy, multiple previous upper abdominal surgeries, and when laparoscopic approach fails.

Conversion to open cholecystectomy may be required in the presence of extensive adhesions which may follow multiple prior upper abdominal operations, when delineation of the anatomy is difficult, after onset of complications, or situations of instrument failure.

Overall serious complication rate remains higher than that seen in open cholecystectomy, despite the increasing experience with the procedure [2, 3]. The perioperative complications may be trocar- or energy source-related injuries, and vascular or bile duct injuries during dissection. Interestingly, the complication rate of open cholecystectomy has increased as well, due to declining exposure to open surgery [4].

The aim of this study was to assess the profile of the patients mostly with regards to their comorbidities, the complication and conversion rate over the last 10-years, the technical difficulties encountered while operating in these government teaching hospitals, and comparison of the results with those available in the literature on the subject.

Materials and Methods

This study presents a personal experience with LC performed in three different teaching hospitals of West Bengal. Nine hundred and fifty consecutive patients, operated personally by the author, were entered prospectively into a database since 2002. All were admitted for elective cholecystectomy after being declared fit for anesthesia and surgery on preoperative check up by cardiologist and anesthesiologists.

Patients with suspicion of gall bladder malignancy, multiple previous upper abdominal surgeries, or advanced cirrhosis with grossly deranged liver function tests were not considered for LC. Patients with cholelithiasis clinically having pain, rigidity, guarding, and palpable lump in right upper quadrant of abdomen were taken up for LC 6 weeks after resolution of these acute features. Those with diagnosis of common bile duct (CBD) stones, with or without acute pancreatitis, diagnosed preoperatively on the basis of history of jaundice, raised alkaline phosphatase, dilated CBD, or echogenic foci within CBD on ultrasonography (USG) were first subjected to complete endoscopic clearance of CBD followed by LC during the same admission. Those who failed endoscopic clearance were subjected to open surgery and were not included in the study.

The data on patient demographics, comorbidities requiring special precautions, the incidence of "difficult" cholecystectomy and difficulties encountered during surgery, conversion rate, complications occurring at operation or within 6 months of operation, and duration of hospital stay were entered prospectively into a database.

In this study, all procedures where the operating time was more than 1 h from the insertion of the first port to the removal of gall bladder due to difficulties in access, dissection or identification of structures, and extraction were considered "difficult."

The criteria for conversion to open cholecystectomy were intraoperative detection of the type II Mirizzi syndrome or cholecystoduodenal fistula, onset of complications, or failure to identify the junction of the cystic duct and gallbladder within 30 min of starting the procedure.

Those on oral anticoagulants were converted to low molecular heparin preoperatively and started back to oral drugs after 48 h of surgery; antiplatelet drugs were stopped 5 days prior to surgery. Patents were taken up for surgery once the international normalized ratio fell below 1.5. Patients with pacemakers had them set at fixed mode prior to surgery. The patients with cirrhosis of liver underwent subtotal cholecystectomy, leaving the posterior wall of gall bladder attached to the liver; the remnant mucosa was thoroughly fulgurated.

Standard four-port technique adopting the North American approach was used in all cases. Pneumoperitoneum was established by modified open technique through an incision on the superior umbilical fold [5].

A subhepatic drain was placed in all cases. The fascial layers of the umbilical and epigastric ports were routinely repaired with (1–0) polyglactin suture. Patients were allowed for oral administration after 6 h if there was no apprehension about any complication. Patients were discharged after oral feed was tolerated and the drain was removed. First follow-up visit was 1 week after surgery; subsequent visits were at monthly interval for 6 months.

Results

A total of 950 (713 females and 237 males) patients who underwent LC, from May 2002 to May 2012, were included in this study. The mean age of the female patients was 35 years (range15–75), while that of the male patients was 42 (range 18–68). Forty percent of the patients (n=380) were over 45 years of age.

The different indications for LC were the following: chronic cholecystitis (520), symptomatic gallstones presenting with biliary colic (333), gall stone pancreatitis (52), empyema gall bladder (32), and gall bladder polyps/adenomyomatosis (13).

Thirty-two patients had major comorbidities. Ten of them had cirrhosis of liver, 15 patients were on permanent pacemakers, 4 patients had undergone CABG previously, while 2 had a cardiac valve replacement and were on oral anticoagulants, and 1 had paraplegia due to compressive myelopathy following spinal tuberculosis. All except two patients had uneventful surgery. The patient with paraplegia and another patient had cirrhosis of liver bled significantly from the liver bed postoperatively. Both had to be converted to open procedure.

The cases of "difficult LC" were broadly grouped into those due to surgical causes and those due to nonsurgical causes related to instruments/hardware used in laparoscopic surgery. Those due to multiple surgical causes or surgical causes secondary to instrument failure were considered under the subgroup of "multiple causes." The different causes of "difficult LC" are shown in Table 1. The overall incidence of difficult LC was 26 % (n=248). Seventy-seven percent (n=192) of these cases of "difficult LC" were purely due to surgical causes, while 9 % (n=29) were due to instrumental causes.

The overall conversion rate of our series was 6 % (n=57). Out of these 57 cases, 42 % (n=24) conversions occurred during the first 200 cases. Twenty-eight (11 %) cases of difficult LC and five (45 %) cases with major complications had to be converted. The different causes of conversion of this series are summarized in Table 2.

There was no mortality in this period, but 1.1 % (n=11) patients of our series had major complications. Around 36 % (n=4) of the complications occurred in presence of some form of instrumental malfunction. The different complications of

Table 1 Difficult LC (n=248)

Surgical causes (n=219)			Nonsurgical causes (n=29)		
Causes	n	%	Causes	n	%
Frozen Calot's triangle with fibrosed thick walled gall bladder	92	42 %	Insufficient insufflations	10	35 %
Dense adhesions with unclear anatomy	39	18 %	Faulty light cable	6	21 %
Bleeding from liver bed / cystic artery	32	14 %	Faulty light source	5	17 %
Empyema GB with edematous/friable wall	17	8 %	Faulty clip applicator	5	17 %
Anatomical Anomaly[a]	8	4 %	Power failure	3	10 %
Cholecystoduodenal fistula	4	2 %			
Multiple causes	27	12 %			
Conversion rate:11 % (n=28)					

[a] Ductal=2; Vascular=6

this series are summarized in Table 3. Port-site infection due to atypical mycobacterium species was seen in 55 patients of our series. Out of the 110 cases operated in the last 1 year, 37 had port-site infection. They mostly presented 4 to 6 weeks after surgery with painful indurations of the umbilical and /or epigastric port sites followed, within a few days, by seropurulent discharge which was negative, on culture, for acid fast bacilli and gram positive and gram negative bacteria. High-resolution USG of the port sites revealed sinus tracts limited to the skin and subcutaneous tissue without extension to the peritoneal cavity. Diagnoses were made on clinical basis. All were treated by second-line antitubercular medications with oral clarithromycin and ciprofloxacin (500 mg each twice daily for 28 days to 3 months). Five patients with stubborn nodules were treated with local injection of amikacin sulfate (500 mg twice daily for 5 days) which led to bursting of the nodules and their resolution. None required surgical excision and debridement of wound.

Discussion

The present review encompasses the author's experience with laparoscopic cholecystectomy, in various teaching hospitals, over a 10-year period starting roughly from the time it was first introduced in teaching hospitals of West Bengal.

Table 2 Conversion (n=57)

Causes	Number	Percent
Fibrosed thick walled gall bladder with unclear anatomy	25	44 %
Dense adhesions	9	16 %
Empyema GB with edematous/friable wall	8	14 %
Bleeding from liver bed / cystic artery (not due to instrumental failure)	3	5 %
CBD injury:	2	3 %
Cholecystoduodenal / Cholecystobiliary fistula	4	7 %
Instrumental causes	6	11 %

There are some problems inherent to government setup. The quality of the instruments, their maintenance, and availability of the consumables are not uniform in all centers. Improperly trained operation theatre (OT) staff and frequently changing assistants (mostly the junior members of the unit) are definite hindrances. Many times one has to work under suboptimal conditions and need to modify his techniques accordingly.

Seventy-five percent of the patients of this series were females, and their mean age was 35 years. The youngest female was 15 years of age and had chronic hemolytic anemia. This profile matches with that of some reports from this subcontinent [6, 7]. None of the 21 patients with cardiac comorbidities had any problem following LC and only one patient out of 10 with cirrhosis of the liver had major bleeding from the liver bed. We avoided LC in patients with advanced cirrhosis, and subtotal cholecystectomy (the posterior wall of the gallbladder was left intact on the liver) followed by either mucosectomy or electrofulgaration of the remnant mucosa was the standard procedure followed in patients with cirrhosis. In spite of the precautions, one patient had bled profusely from an open sinus in liver bed and had to be converted. Similar results have been cited by other authors previously [8–11].

We had tried to exclude patients with acute cholecystitis from our series; however, as is evident from the results, 18 (2 %) patients of this series had empyema of gall bladder which had escaped both clinical and radiological examination and was only apparent intraoperatively.

The definition of "difficult cholecystectomy" is often subjective, because it can be established by the operator in an arbitrary manner [12]. It is considered difficult when there is risk of complications and safe completion of the laparoscopic procedure cannot be ensured. Some authors consider

Table 3 Early complications (n=11)

Nature of complication	Number n (%)	Cause	Management
Common bile duct injuries			
Detected preoperatively	3 (28 %)	Lateral tear (2)/	Both converted
		Transection (1)	Had delayed biliary reconstruction
Postoperative bile leak	2 (18 %)	Cystic duct stump leak (1)	Managed conservatively
		Leak from accessory duct (1) (Strasberg Type A) [Faulty clip applicator/Poor light source]	Managed conservatively
Significant Bleeding			
From liver bed	4 (36 %)	Unresolved inflammation /cirrhosis	2 Conversion
Cystic Artery	2 (18 %)	Misidentification/Faulty clip applicator	1 Conversion

the procedure "difficult" if it is not possible to identify the junction of the infundibulum and cystic duct within 30 min of starting the operation [13]. Instead of defining "difficult" LC based only on clinico-anatomical situations, we had arbitrarily chosen a time frame for the same (1 h), since instrument failure in this series was an important factor not only prolonging surgery but was also detrimental to the safe completion of the laparoscopic procedure. The incidence of surgical causes of "difficult LC" in our study is similar to that reported in some other previous studies [14, 15]. Among the surgical causes, commonest difficulty encountered was frozen Calot's triangle with fibrosed thick walled gall bladder, seen in 92 patients (42 %), while insufficient insufflations due to gas leak was the commonest nonsurgical cause evident in 10 patients (35 %). Similar results have been in earlier studies [7, 14, 15].

Seventeen (8 %) patients with empyema gall bladder and the patient with Pott's paraplegia who had unresolved inflammation had difficult cholecystectomy. The later was included under the subheading of "multiple causes." For empyema gallbladder, endo-knotting the cystic duct either with silk or preformed endoloops and using the technique of laparoscopic subtotal cholecystectomy as described by some authors could definitely prevent conversions and complications in some cases [12, 16]. Slow diffuse ooze from liver bed was sometimes made worse by conventional electrocautery. Electrofulgaration in spray mode or argon beam coagulator or fibrin glue (when available) or simply gel foam packing of the liver bed was found to be useful in such situations.

When cholecystoduodenal fistula or type II Mirizzi syndrome was diagnosed intraoperatively, the laparoscopic procedure was abandoned and conversion was done immediately.

In today's era of LC, majority of the open cholecystectomies follow conversion from laparoscopic procedure. Conversions, in this study, were resorted to when the laparoscopic procedure was not feasible because of technical difficulties, when the risk of complications was compounded due to unclear anatomy, or with the onset of any complication. Failure to identify the junction of the cystic duct and gallbladder within 30 min of starting the procedure was made an objective criterion for conversion. The conversion rates reported in literature vary widely, but it is below 10 % in most series [17, 18]. In this study, conversion rate to open procedure was 6 % (n=57). The reasons for conversion in this series were mainly fibrosed thick walled gall bladder with unclear anatomy (44 %), dense adhesions (16 %), and unresolved inflammation (14 %). Eight out of the 17 patients with empyema gall bladder had to be converted because of extreme friability of the gall bladder, while the patient with paraplegia with unresolved inflammation had to be converted for bleeding from liver bed.

The overall conversion rate in patients with "difficult cholecystectomy" was 11 %. The latter was considerably higher than that reported in some other series [14]. Le et al. in a recent study also found that inflammation, adhesions, and anatomic difficulty were the three most common causes of conversion, though their conversion rate was much lower i.e., 2.6 % [19]. In our study, the instrumental failure rate (11 %) was much higher than that reported by others [7]. This was found to be an important contributory factor and can explain the relatively high conversion rate especially in "difficult" cases. More than 50 % of the problems with the aging instruments were associated with loss of pneumoperitoneum (secondary to jammed flap valves inside trocars) and insufficient illumination due to faulty light cable.

Major early complications were seen in 11 cases (1.1 %). Bleeding, either from liver bed or cystic artery seen in six patients, was the commonest complication. Oozing from cirrhotic liver bed was the commonest cause. These are similar to what has been previously reported by some others [6, 20–22]. Half of these cases required conversion to control bleeding. There was no instance of any trocar-related major vascular injury or severe bleeding from port sites.

The incidence of major bile duct injury of this series was 0.3 % (n=3) and is similar to the current reported incidence of major bile duct injuries which varies from 0.2 to 0.74 %

[22–26]. We had two cases of lateral tear (both needed conversion for repair over T-tube) and one transection (had delayed reconstruction). Two more cases of postoperative biliary fistula due to leak from the cystic duct stump and from the accessory duct were managed conservatively. Instrument failure or malfunction was responsible, either directly or indirectly, for causing these complications in 36 % of cases (n=4). The overall conversion rate in these cases with complication was 45 % (n=5). There was no instance of port-site hernia.

Another nagging problem which has shown a spurt in recent times is the incidence of port-site infection due to atypical mycobacterium species. There were 55 cases of such port-site infection in this series. Interestingly, 67 % of the cases were seen in last 1 year of the study; its incidence during this period being as high as 33 %. Number of factors may be responsible for this sudden spurt: the instruments that we are using presently have worn out and cannot be thoroughly dismantled and hence cannot be properly cleaned; nonavailability of ultrasonic cleaners; the practice of using personal instruments (which are often used in the private setup as well) to supplement the faulty ones in hospital; disinfection with 2 % glutaraldehyde for 20 min and cleansing them with boiled tap water prior to use; and the overall increase in the number of laparoscopic procedures (consequently less attention to sterilization). The only way to prevent this harassing problem is to keep a strict vigil on the quality of instruments, to avoid sharing of instruments with those used in gynecological and urological practice, use 3.4 % glutaraldehyde for at least 8 h for sterilization and autoclaved water for cleansing, changing glutaraldehyde solution after a maximum of 100 cycles, and autoclaving metallic cannula [27, 28].

These infections are usually caused by *Mycobacterium fortuitum* and *Mycobacterium chelonae*. They are very difficult to isolate and are invariably resistant to standard antitubercular drugs. The only method of obtaining microbiological evidence is through tissue culture from the wall of the cavity. Treatment consists of combinations of second-line antitubercular drugs with macrolides (clarithromycin), quinolones (ciprofloxacin), second-generation tetracyclines (doxycycline), and aminoglycosides (amikacin) [29].

Conclusion

In spite of the fact that we have to work under various constraints in government teaching hospitals, this fairly large study shows that the overall results of LC are acceptable compared to other series from better equipped centers. What we lack are proper upkeep of instruments, availability of certain instruments which are indispensible for advanced procedures, adequate properly trained OT assistants/nursing staff, dedicated minimal access surgery units, institutional efforts to improve formal training in advanced laparoscopic procedures, and proper attention towards the sterilization of the laparoscopic instruments. This is reflected in the relatively greater conversion and complication rates in this series and unacceptably high rates of port-site infection. Attention to the above shortcomings can give results similar to the best of the centers as there is no dearth of skilled personnel. Lastly, increasing patient awareness about early intervention following diagnosis can also contribute vastly towards improving the results of surgery.

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