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A Retrospective Comparative Analytical Study between Open and Laparoscopic Cholecystectomy

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Aim and Background: Gall stone disease is prevalent in Indian scenario, and with introduction of Laparoscopic Surgery in surgical domain, there is a change in preference of patients for Laparoscopic Cholecystectomy. This study aimed to analyze conventional cholecystectomy and laparoscopic cholecystectomy concerning selection of patients, operative difficulties, duration of surgery, operative complications, postoperative analgesia, postoperative hospital stay, morbidity and mortality, and lastly, patients feedback after surgery. **Methodology**: Patients were admitted through SOPD, thoroughly assessed by necessary investigations and PAC fitness, valid informed consent for particular procedure was obtained after pros and cons of said procedure were explained in details to patients and their party **Results**: We found more female patients. It is also observed that in operation time for Laparoscopic Cholecystectomy was significantly less than Open cholecystectomy procedure. Most important observation of this study is that duration of postoperative pain and analgesia required was considerably less in Laparoscopic cholecystectomy group than open cholecystectomy. Duration of hospital stay of patients who underwent Laparoscopic surgery had a hospital stay of fewer than four days, while those who underwent open surgery had more than seven days of holiday. Also found that 1% of patients who underwent open cholecystectomy had bleeding and 8 % with wound infection. Whereas in Laparoscopic surgery, complication rate was found to be 3 % for bleeding, which was minimal and 3 % for wound infection. Conversion rate in Literature in Laparoscopic Cholecystectomy ranges from 3% to 15% in well-trained hands. **Conclusion**: Laparoscopic Cholecystectomy were reduced postoperative pain and less analgesic intake, reduced hospital stay, fewer wound complications, rapid recovery, and early return to normal work. Open Cholecystectomy is preferred method in case of difficult cholecystectomy.

Keywords: Cholelithiasis, Laparoscopic Cholecystectomy, Open cholecystectomy. Complications

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Introduction

Gall stones are the primary cause of morbidity and mortality all over the world. Until the end of the 1980s, Open Cholecystectomy was the Gold standard treatment of Gall bladder stones, and the first cholecystectomy was performed in 1882 by Karl Langenbach [1]. In India, as many as 16% and 20% of women above 40 to 49 years and 50 to 59 years respectively have gallstone disease [2]. Various studies performed on mortal suggests that most of the gall stones are asymptomatic. In a survey of 9332 post-mortem reports performed over 10 yrs. 14% of those with Gallstone had undergone cholecystectomy, indicating that up to 86% were asymptomatic. Karl Langenbuch, in 1882 quoted, "Gall bladder should be removed not because it contains stones but because it forms them".[3,4]It is now the Goldstandard Treatment of Gall stones and the commonest operation performed.

Many alternative methods for the treatment of gall stones have been developed. Still, these have not been found satisfactory for ages, and Cholecystectomies has been the Gold standard treatment of cholelithiasis. The advent of Laparoscopic cholecystectomy has revolutionized the treatment of gall bladder disease. It is now the Gold standard Treatment of Gall stones, and the commonest operation performed Laparoscopic worldwide globally [5, 6]. The indications for Laparoscopic Cholecystectomy are the same as open cholecystectomy. However, the rate of Cholecystectomies is increased by 20 percent. The advantages of the patients in terms of pain, stay in hospital, recovery time, costs, and [7] cosmetic results are considerable. As stated by Alfred Cuscheri," there have been a few instances in the history of surgical Practice where the benefits of the procedure so clearly manifested within such a short period "[8]. The first Laparoscopic cholecystectomy was performed in Lyon, France, by PhilippeMouret,Quitos,andPersatt in 1987[9].

Although it showed early promising results, recent trials show an increase in operative complications, widespread bile duct injury [10]. Expensive Instruments, specialized skills and a long learning curve also limit the use of Laparoscopy. The recent upsurge in minimal access surgery has ushered in a new era of surgical management in every surgical Specialty [11]. Despite many publications on the subject, the majorities of papers make no scientific comparisons with the open operation but make presumptive claims of the benefits of the Laparoscopic approach. In the few articles that give the comparative data, the information has been collected retrospectively, and no attempt has been made to randomize [12,13].

Materials And Methods

Our study is a retrospective comparative analysis which included –200 patients with Gall stones who were admitted in Unit II Surgery of Surgery Department between Jan 2016 to June 2016 at ESIC Medical College, Joka Kolkata – 700104, West Bengal. The selection of the patient was made as per our study inclusion and exclusion criteria. The study involved preoperative assessment, intraoperative procedure and postoperative management for up to 4 months. The study module included operative duration, postoperative pain management, postoperative stay and inoperative and postoperative complications.

All patients underwent routine investigations, including liver functions tests, Hemogram including Blood sugar level, blood urea and creatinine, ECG, Chest X-Ray, and USG – Whole Abdomen. The main diagnostic investigation was USG of the whole abdomen to confirm cholelithiasis or other abnormalities in the Gall bladder and the biliary tree. The patients were studied concerning their clinical presentation and were grouped as patients with asymptomatic gall stones and with chronic calculus cholecystitis.

Inclusion criteria: Patients confirmed by USG with symptomatology consistent with cholelithiasis and fit for cholecystectomy.

Exclusion Criteria: * Patients with the following criteria were excluded from the study:
01. Patients with Jaundice

02. Imaging suggestive of CBD stones

03. Patients with Acute Cholecystitis

04. Patients above 75 yrs of age

After complete preoperative investigations and anesthetic checkups and those patients satisfying the inclusions and exclusion criteria for our study were subjected to open and Laparoscopic

Cholecystectomy.Depending on the imaging report regarding the gall bladder wall, adhesions, CBD, contour and size, patients were taken up for operation, General Anesthesia was administered to all patients, a Nasogastric tube was inserted, and Foley's catheterization was done irrespective of the procedure. The first dose of antibiotics was issued at the time of intubation.

All the patients were followed up for a period of 3 to 6 months after the surgical operation.

Results

01. **Sex and age:**In this study, 100 cases were subjected to Laparoscopic Cholecystectomy and 100 cases to Open Cholecystectomy.Majority of the cases reported in the dept with gall stone were found in the age group of 41 – 50 yrs as presented in Table 1. In contrast, out of the total number of gall stone patients reported in the dept, female patients are more in number (Table 2), which is statistically significant compared to male patients.
02. **Timefactor**: The operating time for Laparoscopic Cholecystectomy was more than the open procedure as presented in Table 3. It is seen that the range of operation time for Laparoscopic Cholecystectomy was 75 mins to 120 mins, while that of open cholecystectomy was 60 – 100 mins.
03. **Analgesia**:It has been observed that the duration of postoperative pain and analgesia required were significantly less in the Laparoscopic cholecystectomy group, as shown in Table-4 and Table 5, respectively.
04. **Bleeding**: 3 % of patientshad minimized bleeding (<100 ml), whereas 1% who underwent open surgery had about 100 – 200 ml of bleeding in the open cholecystectomy category.
05. **Antibiotics & Analgesics**: Laparoscopic Cholecystectomy patients required antibiotics forfour days in the hospital and another seven days after discharge, whereas in open surgery, analgesic required was for at least 7 -10 days in hospitals and seven days after release, while three patients even needed for more than 12 days. The need for analgesics is more open than in Laparoscopic Surgery, according to Waldner H et al. and Supe AN et al. [22,.25].
01. **Hospital stay**: It was found that 78 % of patients who underwent Laparoscopic surgery had a hospital stay of fewer than four days, while those who underwent open surgery had more than 5-7 days of stay in 22 % of cases.
02. **Conversion**: 4 cases were needed (n=100) from laparoscopic to open cholecystectomy, of which twowere due to intraoperative bleeding and two due to bile duct injury.
03. **Drains**: Drains were given in all cases in our study group irrespective of the mode of cholecystectomy. Table 7 shows in detail the comparison of abdominal drain between the two groups.
04. **Complications**: In the present study, it was found that 1% of patients who underwent open cholecystectomy had bleeding and 8% with wound infection. In Laparoscopic surgery, the rate of complication was found to be 3 % for bleeding, which was minimal and 3% for wound infection Rest of the Laparoscopic cholecystectomies were uneventful. The details of the complication are summarized in Table 8.
05. **Cost**: According to Stevenlttp et al. cost involved in open surgery is found to be more than Laparoscopic Surgery [28]. In another study, there was not much cost difference between both procedures [26]. However, the cost of the present study underwent in this hospital could not be evaluated as it is done in Central Govt. Hospital under Central Insurance Scheme (ESIC).

Table 1: Age Distribution of Patients Who Underwent Laparoscopic Cholecystectomy (L/C) & Open Cholecystectomy

AGE GROUPS (YRS)	(L/C) %	(O/C)%	TOTAL (%)
21-30	17(17)	12(12)	29 (14.5)
31-40	26(26)	31(31)	57 (28.5)
41-50	35(35)	39(39)	74(37)
51-60	15(15)	13(13)	28(14)
61-70	7(7)	5(5)	12 (6)
TOTAL	100	100	200

Table 2: Sex – Wise Distribution of Patients Who UnderWent Laparoscopic & Open Cholecystectomy

SEX	L/C(%)	O/C(%)	TOTAL (%)
MALE	37(37)	40(40)	77(38.5)
FEMALE	63(63)	60 (60)	123 (61.5)
TOTAL	100(100)	100(100)	200(100)

Table 3: Comparison Between Laparoscopic & Open Cholecystectomy Based On Operative Time

OPERATION	TIME	TIME	TOTAL
	<90 MIN(%)	>90 MIN (%)	
L/C	42(42)- 75 mins	58(58) 120mins	100 (50)
O/C	37(37) – 60 mins	63(63) 100 mins	100 (50)
TOTAL	79 (39.5)	121(60.5)	200 (100)

Table 4: Comparison Between Laparoscopic & Open Cholecystectomy Based On Pain Score (As Per Visual Analogue Scale **)

PAIN SEVERITY	L/C (n= 100)	O/C (n=100)	TOTAL (%)
NONE	11	2	13(6.5)
MILD	59	17	76(38)
MODERATE	23	61	84(42)
SEVERE	7	20	27(13.5)

** Cut Off For Visual Analogue Scale (Vas)

- No Pain ---- (0-4mm)
- Mild pain --- 5- 44mm)
- Moderate pain ----- (54-74mm)
- Severe pain ----- (75-100mm)

Table 5: Comparison Between Laparoscopic & Open Cholecystectomy Based On The Duration Of Analgesic Post- Operatively

Operation	duration of analgesic days	
	<5 Days (%)	> 5days (%)
L/C (n=100)	76	24
O/C (n=100)	31	69
TOTAL(%)	107(53.5)	93(46.5)

Table 6: Comparison Between Laparoscopic & Open Cholecystectomy Based on Length of Hospital Stay

OPERATION	STAY			
	<3 DAYS (%)	(3-4)DAYS(%)	(5-6)DAYS(%)	>7DAYS(%)
L/C(n=100)	31(31)	47(47)	15(15)	7(7)
O/C(n=100)	19(19)	50(50)	21(21)	10(10)
TOTAL (%)	50(25)	97(48.5)	36(18)	17(8.5)

Table 7: Comparison Between Laparoscopic and Open Cholecystectomy Based On Duration Of Keeping Postoperative Abdominal Drain

OPERATION	DURATION OF	ABDOMINAL	DRAIN
	Up to 24 hrs	24-48 hrs	48-72 hrs
L/C(n=100)	34	55	11
O/C (n=100)	17	64	19
TOTAL (%)	51 (25.5)	119(59.5)	30(15)

Table 8: Comparison Between Laparoscopic & Open Cholecystectomy Based on Various Complications

COMPLICATIONS	L/C (N=100)	O/C (n=100)	TOTAL (%)
HAEMORRAGE	3	1	4(2)
VOMITING	2	7	9(4.5)
WOUND INFECTION	3	8	11(5.5)
WOUND DEHISCENCE	0	1	1(0.5)
INTRA ABDOMINAL INFECTIONS	0	2	2(1)
POST-OP CARDIAC COMPLICATIONS	0	0	(0)
POST-OP PULMONARY COMPLICATIONS	3	1	4(2)
BILE DUCT INJURY	2	0	2(1)
CONVERSION	4	0	4(2)
INTESTINAL PERFORATION	0	1	1(0.5)
POST-OP PARALYTIC ILEUS	3	7	10(5)
DEATH	0	0	0(0)

Discussion

Carl Langenbuch stated that "Gall bladder should be removed not because it contains stones but because it forms them"[14]. The goal of both Laparoscopic and open techniques is to safely remove the gall bladder with low mortality, little morbidity and early recovery [15]. Laparoscopic cholecystectomy was first performed in Lyon, France, in March 1987 by Phillip Moeret, and sufficient time has elapsed since then, and explosive growth of MIS of which Laparoscopic Cholecystectomy is prototype mandates the need for comparisonconcerning morbidity and mortality. Most Surgeons have passed through the learning curve phase of their experience and have settled into an established pattern of activity [16,17].

Few attempts have been made to carry out prospective randomized trials of Laparoscopic and open approach to cholecystectomy, and no such study has been completed. The Authors of the attempt failed to describe problems with randomization when patients or their surgeons perceived a great benefit from the new procedure, and it was felt unethical to place patients in the control arm [18]. Our study of thecholecystectomy technique has attempted to make a valid comparison between the new Laparoscopic approach and the tradition of the open Laparotomy approach since its introduction in 1888.

Laparoscopic cholecystectomy is a minimally invasive procedure where the Gall Bladder is removed using the Laparoscopic technique. The indications are the same as for open cholecystectomy. A successful outcome is dependent on the proper selection of patients, meticulous technique and a positive attitude towards conversion to open cholecystectomy [19]. The main contraindications are unacceptable anesthetic risks and difficulty in identifying the structures within the portal area and Callot's triangle [20].Laparoscopic cholecystectomy is usually performed using four or five ports (small punctures) in the anterior abdominal wall. One 10 mm port for the Endoscope, another 10 mm for the working element for Callots triangle dissection and two 5mm on the right flanks for fundus traction and Hart" s man pouch traction.

The time taken for Laparoscopic Cholecystectomy was found to be more than open cholecystectomy, according to Supe AN et al.[21]. According to the present study, the overall time taken for laparoscopic surgery was 75 -120 mins. The significant difference could be due to the long learning curve for laparoscopic surgery.

The present study also found that 1% of patients who underwent open cholecystectomy had bleeding and 8 % with wound infection. Whereas in Laparoscopic surgery, the complication rate was found to be 3 % for bleeding, which was minimal and 3 % for wound infection, which was similar to the findings of Ceubajo& Caballero et al.'s study [26], which reported that the rate of complication was more in open procedure than in Laparoscopic Surgery [21,27].

In our study, recovery has been compared prospectively with the open operation. However, we have not studied return to work but return to the outpatients department at 5-7 days after surgery, in which it is found in this study that most patients were leading an active life. In the present study, only two patients who underwent Laparoscopic Surgery took more than one week to resume routine work. In contrast, all patients who underwent open surgery took upto 15 days or more to continue routine work. This finding is also following the results of other researchers, according to Verma et al. [27].Patients who underwent open cholecystectomy had higher hospitalization than those who underwent Laparoscopic cholecystectomy

In the study conducted by Carbajo et al.[21].Supe AN et al.[26] and Verma GR et al.[27].It is also reported that the patients who underwent Laparoscopic Cholecystectomy can get back to their routine work much faster. The mean time for Laparoscopic patients to resume routine activity was 12.8 days while 34.8 days in case of open cholecystectomy as seen in steventtpetal's study [28]. The advantage of this rapid recovery is the single most attractive feature of the Laparoscopic technique both from the patient's viewpoint and for hospital cost-effectiveness.

The reduction of post-operative pain experienced by the patients has been documented in this study using both objective and subjective criteria. The disturbance to the abdominal musculature is much less with trocar stabs than with muscle cutting incisions. The patients can mobilize fully immediately after surgery, in dramatic contrast to the open technique where mobilization returns gradually over several weeks.

The complications after open cholecystectomy are more significantinthe operative field and the other, especially the respiratory system. Reductions in wound infections would be expected given that only one pass of a stainless steel trocar is required at each site, and the small wounds are effectively closed during the operation. Restriction to respiratory function has been thoroughly documented after open cholecystectomy in studies that compare the midline Laparotomy with subcostal incision [11]. Although we have not examined specific respiratory function tests, our results have shown a lower incidence of atelectasis and lower respiratory tract infections. This may be due to reduced postoperative pain and lack of diaphragmatic splinting post-operatively. We have not seen any cardio-respiratory problems related to the creation of the pneumoperitoneum. There is concern about the possibility of an increased incidence of bile duct injury with Laparoscopic surgery. In our study, it is 2, i.e.1% is too small to provide any conclusive evidence on safety. The frequency of bile duct injury is 0.1 -0.2% for open cholecystectomy and 0.3% -0.6% for Laparoscopic cholecystectomy.

Conversion rates in Laparoscopic cholecystectomy range from 3% to -15% in well-trained hands; in our series conversion rate is 4, i. e. 4%. The two most common reasons for conversion are dense

Upper abdominal adhesions or necrotic gall bladder that precludes graspingand elevation with a grasper. Common risk factors for conversion are male gender, obesity, cholecystitis after 72 hours, and CBD stones. It is, therefore, mandatory to explain to the patients about the possibility of conversion to open technique at the time of taking consent for laparoscopic cholecystectomy.

Wound infection in the open procedure is three times the laparoscopic procedure. Jatzko et al., in their study, observed that wound complications rate is lower in the laparoscopic cholecystectomy group (0.3%) as compared to the open cholecystectomy group (5.1%). Our study shows 3% in the Laparoscopic group and 8% in the open group.

Conclusions

Laparoscopic cholecystectomy is the preferred method in the treatment of Gall stone disease, the advantage of which is as follows:-

01. Technically the dissection of the Cystic artery and Cystic duct is very precise, and the view of Callot" s triangle is very much magnified. Bleeding is easily controlled with less perioperative blood loss.
02. Laparoscopic cholecystectomy is associated with less chance of wound infection, and there is no risk of wound dehiscence and herniation.
03. The degree of postoperative pain and its duration is more minor.
04. The duration of hospital stay is less and hence can be quickly discharged and thereby less bed occupancy resulting in more turnovers;the result is an increase in the total resource used while the cost per patient is reduced.
05. There is an apparent cosmetic advantage.

The most significant impact of the new technology is that it has allowed many patients to have their operation, which would otherwise have stayed on a long waiting list. However, open cholecystectomy is the preferred method for surgeons at the beginning of their career and in cases of difficult cholecystectomy.Rate of complications doesn't show a significant difference between both groups. With training, it is getting popular and has proven to be a safe procedure with low morbidity and equal mortality rate compared to open cholecystectomy.

Contribution by Authors

Dr Siladri Sengupta - Planning, the study of designing, data analysis, Review of literature, Conducted writing, **Dr Subhadip Sarkar** - Data collection and Formatting, Review of Literature, & Proofreading, **Dr Aparup Ghosh**- Medical records screening, Data collection & Proofreading

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