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A Study on the Conversion Rate of Laparoscopic Cholecystectomy to Open Cholecystectomy and Its Causes with Special Reference to Rural Population

Nisith Ranjan Mallik[1], Supratim Bhattacharyya [2], Ashis Kumar Saha[1], Chhanda Das[3]

[1](Associate Professor, Department of General Surgery, Calcutta National Medical College, Kolkata, India)
[2](Senior Resident, Department of Oncosurgery Surgery, Apollo Genleagle Hospital, Kolkata, India)
[3](Assistant Professor, Department of Pathology, IPGME&R, Kolkata, India)
Corresponding Author: Ashis Kumar Saha

Abstract: *Today Laparoscopic cholecystectomy has replaced open cholecystectomy as the 'gold standard' in treatment of patients with symptomatic cholelithiasis. Advantages being relatively less pain, early ambulation, shorter hospital stay and lower incidence of incisional hernia. The condition of the patient, the level of experience of the surgeon, and technical factors all can play a role in the decision for conversion. This study was conducted in an effort to determine the conversion rate and also identify the factors responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy. Hence, these findings will allow us to preoperatively discuss the higher risk of conversion and allow for an earlier judgement and decision on conversion if intra-operative difficulty is encountered. This was a prospective clinical study consisting of 112 patients undergoinglaparoscopic cholecystectomy. All patients were admitted in Bankura Sammilani Medical College and Hospital from June 2014 to May 2015. Data was collected by meticulous history taking, careful clinical examination, appropriate radiological, haematological investigation, operative findings and follow-up of the cases. In conclusion, laparoscopic cholecystectomy is a safe and minimally invasive technique, with only low conversion rate and the commonest cause of conversion in this study was the presence of dense adhesions at Calot's triangle*

Keywords – *Laparoscopic cholecystectomy, incisional hernia, Calot's triangle.*

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I. Introduction

Gallstones are among the most common gastrointestinal illness requiring hospitalization with a prevalence of 11% to 36% in autopsy reports. The optimal treatment for patients with symptomatic cholelithiasis is cholecystectomy.[23] Laparoscopic cholecystectomy is the procedure of choice for the majority of patients with gall bladder disease. These postulated advantages of laparoscopic cholecystectomy are the avoidance of large incision, shortened hospital stay and earlier return to work. The condition of the patient, the level of experience of the surgeon, and technical factors all can play a role in the decision for conversion. Inability to define the anatomy and difficult dissection are the leading reasons for conversion followed by other complications like bleeding. The conversion rate for elective laparoscopic cholecystectomy is around 5%, whereas the conversion rate in the setting of acute cholecystitis may be as high as 30%. Our purpose in this study was to determine the conversion rate and also identify the factors responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy. Hence, these findings will allow us to preoperatively discuss the higher risk of conversion and allow for an earlier judgement and decision on conversion if intra-operative difficulty is encountered.

II. AIMS & OBJECTIVES

1. T To determine the rate of conversion of laparoscopic cholecystectomy to open cholecystectomy.
2. To identify the factors responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy.
3. To determine the incidence and outcome in rural population with respect to the general population.

III. MATERIALS & METHODS

Source of data: All patients undergoing laparoscopic cholecystectomy at Bankura Sammilani Medical College and Hospital, Bankura from June 2014 to May 2015, and includes 112 patients from Bankura and adjoining

ares. This is a prospective study conducted over 1 year.

Methods of Collection of Data: All patients presenting with cholelithiasis without choledocholithiasis; and with no contraindication for general anaesthesia were included in the study. Medical records of all patients who underwent LC were reviewed. Data recorded included demographic information, past medical history, indication for operation, duration of operation, reason for conversion and post-operative complications. For the purpose of comparing between urban and rural population, 2001 Census of India guideline has been used to define urban area or 'town'.

Inclusion criteria:

1. All symptomatic patients with calculous cholecystitis
2. Patients presenting with acalculous cholecystitis
3. Age > 18 years

Exclusion criteria:

1. Acute Cholecystitis
2. Choledocholithiasis
3. Carcinoma of gall bladder
4. Perforated gall bladder
5. Patients unfit for general anaesthesia
6. Previous upper abdominal surgery
7. Refractory coagulopathy.

The general bio-data of patient regarding his name, age, sex, religion, occupation, socio-economic status and address was collected. A detailed history was taken with special reference to duration of right upper quadrant pain or epigastric pain, its periodicity, its aggravation by fatty meals and relief by oral or parenteral analgesics. Any significant past history was also enquired. A relevant general physical examination, abdominal and systemic examination was done. Pre-operative work up included a complete blood count, blood sugar, blood urea, serum creatinine, liver function tests, hepatitis profile, X-ray chest and ultrasound of abdomen. Ultrasonogram was routinely performed on all patients to confirm the clinical diagnosis of cholelithiasis with number of calculus and size of calculus, gall-bladder wall thickness (>4mm was considered abnormal), pericholecystic collection and CBD calculi or dilatation of CBD. A routine pre-anaesthetic checkup was done. A fully explained well informed consent was taken with explanation of risk of conversion to open cholecystectomy. A nasogastric tube was placed in all cases for gastric decompression to prevent trocar injury. All patients received prophylactic pre-op antibiotics (Inj. Ceftriaxone 1gm IV). The patients were operated by different senior surgeons. The operation was performed with standard four port technique, using carbon dioxide for peritoneal cavity insufflation. The Veress technique was used to obtain pneumoperitoneum. Cystic artery and cystic duct were skeletonized and clamped with metallic clips separately. Following gall bladder removal, No.16 romovac suction drain was placed in all cases. All patients had oral liquids followed by food from 2nd day after surgery, provided there was no nausea and vomiting.

IV. Results & Analysis

A prospective study was carried out in the Department of General Surgery, during the period from June 2014 to May 2015 in 112 patients undergoing laparoscopic cholecystectomy. The patients belonged to various surgical units in BSMCH and full details of the patients were recorded in the proforma. Observations and analysis of all the parameters studies are as follows. Total number of conversion was found to be 13 in 112 patients which measures to be 11.6%. In the total of 112 patients, 18 were male and 94 female with a ratio of male:female being about 1:5. The above chart shows higher incidence of gallstone disease in female. In our study, the conversion rate was also higher in female (13%) as compared to male (6%). Proportion of patients undergoing conversion was 5.6% among males whereas 12.8% conversion rate was noted among females. But the difference is not statistically significant ($p>0.05$). In our study, out of 112 patients, 58 were from urban population and 54 were from rural community. We noted 7 conversions in urban population (12.07%) and 6 conversions in rural community (11.11%). The rate of conversion was a little higher in rural community, but it was not statistically significant ($p>0.05$). So, we conclude there is little role of residential variation in conversion. In the study, only symptomatic cholecystitis patients were included and pain abdomen was the commonest and universal symptom, often associated with other symptoms like vomiting, dyspepsia and fever as well. However, there was no association noted between the site of pain and rate of conversion. So, conversion can possibly not be predicted solely based on the symptomatology of the patient. One patient in our study presented with pain in RUQ along with palpable GB on clinical examination. He was Murphy's sign positive. USG showed multiple stone in GB with the largest one being 8mm in diameter, sitting at the neck of GB with

GB distension. On operation, mucocele was noted with adhesion of GB to surrounding. Aspiration of bile was performed intra-operatively and lap. cholecystectomy performed safely. Operative time was 46 mins. The patient recovered uneventfully post-operatively. Out of the 112 patients studied, most of the patients were in the BMI range of 18.5-24.99, with the average BMI being 24.28. However, conversions were associated with higher BMI. 8 of the 44 patients (18.18%) in the BMI range of 25-29.99 and 5 of the 6 patients (83.33%) in the BMI range of >30 were converted to open surgery. Mean BMI of the patients undergoing conversion was 29.23± 2.27 and among non-converted patients, it was 23.63± 2.70. The difference is statistically significant (p>0.05). So, conversion can be said to be associated with higher BMI from this study. Conversion was found more in patients suffering from diabetes and hypertension. However, the reason for so was not fully understood. There is a possibility that these are mere associations and not causative for conversion. There was no significant rise in the risk of conversion in patients with other co-morbidities like IHD, COPD and epilepsy. Anatomical and physiological considerations occasionally hinder or preclude minimally access approach and in those cases, a conversion reflects sound clinical judgment and not a complication. There are various reasons for conversion, but the commonest one we found in our study was difficult anatomy of Calot's triangle. The other causes were bleeding and CBD injury.

V. Discussion

Cholelithiasis is a common disease entity. Frequent occurrence and serious complications of cholelithiasis have made this one of the most important surgically correctable diseases. Open cholecystectomy has being a gold standard for the treatment of gallbladder diseases for more than 100 years since Carel Johann Langenbuch has performed first open cholecystectomy in 1882 [6]. First laparoscopic cholecystectomy in human has been performed in 1987 by Dr. Philip Mouret to become the new gold standard and almost replaced open cholecystectomy for the treatment of gallbladder disease [6]. The first laparoscopic cholecystectomy in India was performed in 1990 at the JJ Hospital, Mumbai, followed by few months later in Pune by Dr. Jyotsna Kulkarni.[9] Conversion to open surgery is not visualized as a complication, rather a matter of sound surgical judgment as patient safety is of foremost importance.

Age incidence

No age is said to be immune to gallbladder disease, however they were more common in the third, fourth and fifth decades of life as 75% of the cases belonged to these decades. However, in our study maximum incidence was seen in the age group of 21-30 years i.e, 47 patients (41.96%) followed by that in 41-50 years i.e, 23 patients (20.54%). Our study population was younger, mean age 38.13 years. Daradkeh [52] reported mean age of 47.2 years, whereas Bingener et al [51] 40 years. All the 112 patients were planned for elective laparoscopic cholecystectomy. 13 out of the 112 patients i.e, 11.6 % were converted to open cholecystectomy. Maximum converted patients were in the age group of 26-30 years i.e., 5 patients (17.86%). Workers like Thomas B Hugh et al [68], R Schmitz et al [69] have reported a similar peak incidence in the 3rd and 4th decade.

Sex incidence

The main sufferers of gallbladder disease in our study were females as compared to males. Out of total 112 cases, 94 (84%) were females and 18 (16%) were males, which are very much similar to those observed by Frazee et al [70] and U.Berggren et al [71]. The reason for the high incidence among females could be that pregnancy and child birth have a definitive influence on biliary tract disease, acting by casual stasis as well as weight gain and consequent hypercholesteremia. In a series of 6147 patients of laparoscopic cholecystectomy by Singh Kuldip et al [6] (1993-2004) 2124 were males (34.5%) and 4023 were females (65.4%) with an average age of 48.6 years (range 22-84 years). In another series of 6380 patients of laparoscopic cholecystectomy by Singh Kuldip et al (1992-2005) 2250 were males (35.2%) and 4130 were females (64.7%) with an average age of 49 years (range 22-84 years).Thus our study coincides with both the studies of Singh Kuldip et al. In our study, 5.55% males required conversion as compared to 12.7% females; this was similar to Ibrahim et al [50], Brodsky et al [72] and Al Salamah [64] also found male gender as a most significant determinant for conversion to OC. Gharaibeh et al [73] reported 24% conversion rate in males vs. 4% in females, whereas Lim et al [60] reported 16.6% conversions in males vs 8.2% in females.

Symptomatology

Out of 112 operated patients, 90 patients (80.4%) presented with a chief complaint of pain in the right hypochondrium, 22 patients (19.6%) presented with pain in the epigastrium.

BMI vs conversion

Higher conversion was noted with people with BMI>30 with rate approaching nearly 84% . Though it is easier to perform cholecystectomy with minimally invasive technique than open procedure in obese people, still the rate of conversion is more in this group when compared to lesser BMI population.

Co-morbidities

In a study by Adbikardid Bedirli, Erdogan M. Sozuer et al [74] between 1993 to 2000, conversion to open cholecystectomy was required in 19 of 678 patients in non diabetic group (2.8%) and 13 of 184 patients in diabetic group (7.1%). The author's concluded laparoscopically cholecystectomy in diabetic patients is associated with more morbidity and a higher conversion rate than that in non diabetic patients. In our study of 112 cases of laparoscopic cholecytectomy, conversion to open cholecystectomy was required in 12 of 108 patients in non diabetic group (11%) and 1 of 4 patients in diabetic group (25%). Hence there is a correlation in both the studies. In a study by Tayeb M, Raza syed Ahsan et al [67] from 1997 to 2001, out of 73 converted patients 20 were hypentensive (27.4%) and out of 146 successful patients 29 were hypertensive (19.9%). In our study, out of 13 converted patients 2 were hypertensive (15.4%) and out of 99 successful laparoscopies 5 were hypertensive (5%). So our study correlates with their study, stating that there is a bit higher risk of conversion in hypertensive patients.

Ultrasonography

Today ultrasonograhy is the best non-invasive, economical and an easily available investigation.In our study, 10 out of 112 patients showed a thickened gall bladder wall on ultrasonography, of which 6 patients (60%) were converted. Out of the remaining 102 patients in whom the gall bladder wall wasn't thickened, 7 patients (6.8%) were converted. Conversion was more associated to increased size of gallstones than the actual number of stone(s) present. More conversions were noted in patients having size of stone >1cm. In a study by Pawan lal et al [75], they found a good correlation between gall bladder thickness and conversion to the open procedure (sensitivity of 41.18%) and a positive predictive value of 70 which was in accordance with the reports of other studies by Daradkeh et al[55] , Alponat A et al [76], Jansen S et al[77], Santambrigo R et al [78] and Chen RC et al [79]. In another study by Tayeb M et al [67], 58% of the patients with gallbladder wall thickness more than 3mm were converted to open cholecystectomy, suggesting gall bladder thickness as a good predictive factor for conversion.

Residential variation- Rural vs Urban

In our study of 112 patients, 61 patients were from urban population and the rest, i.e., 51 patients were from rural community. The conversion rates of these two residential areas were 7 and 6 respectively. So, the percentage conversion for urban population was 11.47% and for rural community, the same was 11.76%. These findings were close to each other. Hence, no firm conclusion can be drawn solely based on the residential variation of patient pool. P.N. Sreeramulu and Vijay P Agarwal noted similar results in their study of 120 patients [80]. Jason A Kemp and Randall S. Zuckerman noted similar conversion, in hospital stay and overall mortality in urban vs rural population in their study [81].

Conversion to open procedure

Conversion to open technique is considered a major morbidity of LC as it loses its supremacy over open technique once the conversion takes place. The conversion rate in this study was 11.6% and this is comparable to the conversion rate of 2.6% to 14% reported in literature. In 9 of the 13 converted cases (69%), conversion was due to difficult anatomy of Calot's triangle which was difficult to deal with laparoscopically. In another 3 patients (23%), conversion was conducted because of inadvertent bleeding from Calot's triangle which again could not be managed by laparoscopic approach. Only 1 of 13 patients had intra-operative CBD injury and was converted to open to end up with choledochoduodenostomy.

VI. Conclusion

The present study of 112 patients has shown that gall bladder diseases were more common in females as compared to males with a ratio of 1:5 (84 % of the patients were females). The commonest age of presentation of gall bladder diseases is 21-30 years (42% of the patients presented in this age group). Most of the patients (80%) presented with the chief complaint of pain abdomen in the right hypochondrium. Conversion to open cholecystectomy was found more in female population with BMI above 30. Diabetic patients had a higher rates of conversion than non-diabetic patients i.e, 1 out of 4 patients (25%) as compared to 12 out of 108 non diabetic patients (11%) got converted. Thus diabetes is one of the important factors for conversion. It is maybe because of the immunodeficient state that renders the patient more vulnerable to repeated infection and subsequent pericholecystic adhesion formation. Also there is a bit higher risk of conversion in hypertensive patients with conversion among hypertensives approaching nearly 29%. The reason for this is not clear though. No clear cut evidence was found in regional variation of patients as far as conversion was concerned and the rate of conversion was almost similar in both the population. Ultrasonography appeared to be the most economical, simplest, easiest and an early tool for the evaluation of gall bladder diseases. Pre-operative USG can dictate the risk of conversion. In this study, pericholecystic fluid collection, thickened GB wall and large stone load were

proved to be associated with significant risk of conversion. The main intra-operative cause of conversion from laparoscopic cholecystectomy to open was difficulty in identifying the anatomy as a result of dense adhesions (69%) followed by hemorrhage in the Calot's triangle (23%) and injury to the CBD (8%). Laparoscopic cholecystectomy is a reliable and safe surgery. With growing experience in laparoscopic technique, it is possible to bring complications and conversion rate to minimum. The present study has shown that we still have higher conversion rate comparing with the literature in last five years. While many reasons lead to conversion and influence conversion rate, the most important reason for conversion was dense and extensive adhesions. It is, therefore, mandatory to explain to the patients about the possibility of conversion to open technique at the time of taking consent for LC. In conclusion, LC is a safe and minimally invasive technique, with only low conversion rate and the commonest cause of conversion in this study was the presence of dense adhesions at Calot's triangle

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