Laparoscopic versus open surgical management of patients with Mirizzi’s syndrome: A comparative study

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**Abstract**

**Introduction:** Open surgical management is considered as ‘standard of care’ for patients with Mirizzi’s syndrome (MS). Laparoscopic management of MS has been reported, but comparative studies are lacking.

**Patients and Methods:** This retrospective study included patients with MS who were treated by a single surgical team from May 2009 to December 2017. Patients with total laparoscopic surgery were included in laparoscopic group (LG) and patients with total open surgery were included in open group (OG). Patients with conversion to open surgery and patients with gallbladder cancer (GBC) were excluded from the study.

**Results:** Total patients were 75; six patients with GBC and 11 patients with open conversion were excluded from comparison. LG had 32 patients and OG had 26 patients. Demographic, clinical and laboratory parameters were similar. Laparoscopic versus open preoperative diagnosis rate was 87.5% versus 69.2% (P = 0.08), respectively. OG had a large number of patients with concomitant bile duct stone; therefore, bile duct exploration rate was higher in OG (P = 0.009). Laparoscopic versus open, mean duration of surgery – 137 min versus 145 min (P = 0.664); mean blood loss – 45 mL versus 70 mL (P = 0.04); mean hospital stay – 4.5 days versus 8.1 days (P = 0.027). Post-operative complication rate was 21.8% in LG and 42.3% in OG (P = 0.042). LG versus OG mean follow-up was 50 versus 38 months (P = 0.189); no remote complication was observed in both groups.

**Conclusion:** The results of laparoscopic surgery in patients with Mirizzi’s syndrome are not inferior to that of open surgery; rather it may help to improve perioperative outcome in selected patients.

**Keywords:** Complications, laparoscopy, Mirizzi’s syndrome, open, outcome

**INTRODUCTION**

Mirizzi syndrome (MS), ‘the functional hepatic syndrome’ as described by Pablo Luis Mirizzi, is an unusual complication of gall stone disease with a reported incidence of 0.6%–5.7%. Open surgical treatment has been ‘standard of care’ for this condition except patients with contraindication or high risk of surgery where endoscopic management may be an option.[5] Paul et al., first reported safety and feasibility of laparoscopic management of MS.[1] Later on, other authors also supported use of laparoscopic approach in patients with type 1 MS (McSherry’s classification), and a few authors reported safety and feasibility of laparoscopic approach in patients with type 2 MS.[2] However, in absence of studies

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comparing laparoscopic approach to open approach in the management of MS, the role of laparoscopic surgery is still controversial. The aim of this retrospective study was to compare results of the laparoscopic approach to that of open approach in patients with MS.

**PATIENTS AND METHODS**

This study was comprised of patients with the diagnosis of MS, operated by a single surgical team starting from May 2009 to December 2017. Demographic characteristics, clinical features, laboratory values, operation details and post-operative outcomes were studied. All the patients had ultrasonography of the abdomen. Patients with clinical and/or biochemical evidence of bile duct obstruction underwent magnetic resonance imaging with magnetic resonance cholangiopancreatography [Figure 1a]. Patients with cholangitis and/or suspicion of bile duct stones were advised ERCP with or without endobiliary stent placement [Figure 1b]. CECT of the abdomen was advised in patients with a possibility of neoplastic aetiology. All patients with a possible mitotic pathology of the gallbladder were considered for open surgery. McSherry’s et al. and Csendes et al. classifications were used for disease stratification. Patients with total laparoscopic management were included in laparoscopic group (LG) and patients with total open management were included in open group (OG). Patients in which laparoscopic surgery attempted but required conversion to open approach were excluded from the study. Patients with final diagnosis of gallbladder cancer (GBC) were also excluded from the study. The duration of surgery was recorded in minutes, and the blood loss was recorded in millilitres. Post-operative complications were recorded as per Clavien–Dindo classification system.

**Laparoscopic technique**

Laparoscopic intra-cholecystic approach, as reported earlier, was used in LG. Patients were placed in 15° to 20° reverse Trendelenburg’s position; chief surgeon and scrub nurse were on the left side, first assistant surgeon was on the left side, first assistant surgeon was on the right side. A cholecystostomy was made over peritoneal surface of the body and neck region of the gallbladder and impacted stone was extracted [Figure 2a]. Bile and gallbladder stones were removed with great care to minimise intraperitoneal spill. Body and fundus of the gallbladder were separated from the liver [Figure 2b]. Polydioxanone 3-0 suture (Ethicon India, Aurangabad, India) was used to fashion choledochoplasty [Figure 2c]. Common bile duct (CBD) was explored in patients with suspicion of bile duct stones. Intraoperative cholangiogram (BV Pulsera, Phillips, Holland) was performed to confirm complete clearance of bile duct stones. Choledochotomy was repaired over a ‘T’ tube (Romosons, India) which was removed after 6 weeks.

**Open technique**

A subcostal incision was used for the laparotomy. The technique of subtotal cholecystectomy was similar to laparoscopic approach. The impacted stone was removed through a cholecystostomy over peritoneal aspect of the gallbladder and bile and stones were removed carefully. Fundus and body region of the gallbladder was removed and remaining part of the gallbladder was used for choledochoplasty with interrupted 3-0 Polydioxanone sutures (Ethicon, Aurangabad, India) [Figure 2d with inset]. In patients with bile duct exploration, choledochotomy was closed over the ‘T’ tube which was removed after 6 weeks.

**Follow-up**

The first follow-up visit was at 2 weeks after surgery then patient visited the outpatient department (OPD) at 6 weeks.
for the removal of T-tube. After 6 weeks, the patient visited OPD at every 3 months for first 2 years, then at every 6 months until the completion of 5 years.

Statistics
Statistical analysis was performed using IBM SPSS Version 21.0 (IBM, IL, Chicago). Parametric numerical data were reported as mean ± standard deviation for continuous variables; nonparametric numerical data were represented as median (range); and categorical variables were represented as frequencies and percentages. Student's t-test and Mann–Whitney U-test were used to compare numerical variables; Chi-square test and Fisher's exact test were used to compare categorical variables; and P < 0.05 was considered statistically significant.

RESULTS
Of total 75 patients, 6 (8%) patients had GBC and therefore excluded from the study. Laparoscopic management was attempted in 43 patients, but 11 patients (25.5%) required conversion to open method, and they were excluded from the study. Reason for conversion was severe adhesion, unclear anatomy and associated intrahepatic stones. Thirty-two patients with total laparoscopic management (LG) and 26 patients with total open management (OG) were included in comparative analysis. The mean age in LG was 45 years, and in OG, it was 47 years (P = 0.56). Sex ratio, clinical presentation, incidence of jaundice and/or cholangitis were not significantly different [Table 1]. Pre-operative diagnosis of MS was possible in 87.5% of patients in LG and 69.2% of patients in OG; however, this difference was not statistically significant (P = 0.08). Incidence of concomitant bile duct stones was 18.7% in LG and 57.7% in OG, and this difference was statistically significant (P = 0.002) [Table 1].

About 75% of patients in LG were treated with subtotal cholecystectomy; 69% patients in OG required CBD exploration in addition to subtotal cholecystectomy; and this difference in surgical procedure was statistically significant (P = 0.009) [Table 2]. Mean duration of surgery in LG versus OG was 137 versus 145 min (P = 0.664). Median blood loss in LG was significantly less than OG (45 vs. 70 ml, P = 0.04). Mean hospital stay was also significantly lower in LG (4.5 vs. 8.1 days, P = 0.027) [Table 2]. The complication rate was lesser in LG, but this difference was not statistically significant. However, no patient in LG developed bile leak and 15.3% in OG developed bile leak (P = 0.042), and all these patients were managed conservatively [Table 2]. Mean follow-up was 50 months in LG and 38 months in OG (P = 0.189). No patients in both groups developed remote complications.

DISCUSSION
Laparoscopic cholecystectomy in patients with MS is technically difficult and associated with a high risk of iatrogenic complications especially bile duct injury.[2-4] Due to stone impaction and obliteration of Calot’s triangle, any effort of dissection between gallbladder and hepatic duct is associated with a high risk of bile duct injury. Intra-cholecystic approach or inside gallbladder approach of cholecystectomy avoids dissection of Calot’s triangle and therefore avoids risk of bile duct injury.[5] In the present study, none of the patients in both groups sustained bile duct injury. In OG, some patients developed bile leak probably from choledochotomy site, all these patients were treated conservatively and did not develop any remote complications. In patients with MS, the wall of gallbladder and bile duct is inflamed and sometimes friable, repair in such situations may be result in bile leak. In order to reduce

**Table 1: Comparison of clinical and demographic profile between laparoscopic and open group**

|                        | LAP (n=32) | Open (n=26) | P     |
|------------------------|-----------|------------|-------|
| Age in years, mean±SD  | 45.0±15.0 | 47.3±14.5  | 0.568 |
| Male/female, n         | 15/17     | 11/15      | 0.794 |
| Symptoms duration in months, median (IQR) | 5 (2.2-8.7) | 5.5 (3-12) | 0.978 |
| Pain, n (%)            | 32 (100)  | 25 (96.1)  | 0.448 |
| Jaundice, n (%)        | 13 (40.6) | 17 (55.3)  | 0.061 |
| Cholangitis, n (%)     | 6 (18.7)  | 7 (26.9)   | 0.535 |
| Hb (g/dl), mean±SD     | 11.2±1.5  | 12.0±1.6   | 0.054 |
| TLC (cells/cumm), mean±SD | 8953±2481 | 8969±4366 | 0.986 |
| Platelet (Lac/cumm), mean±SD | 2.1±0.8     | 2.2±0.7    | 0.570 |
| RBS (mg/dl), mean±SD   | 98.7±10.1 | 105.8±46.5 | 0.405 |
| Bilirubin (mg/dl), median (IQR) | 1.5 (0.9-2.4) | 1.3 (0.7-4.3) | 0.428 |
| Increased serum bilirubin, n (%) | 18 (56.3) | 11 (42.3) | 0.428 |
| ALP (U/ml), median (IQR) | 205       | 244.5      | 0.428 |
| Increased S ALP, n (%) | 29 (90.6) | 23 (88.4)  | 0.498 |
| AST (U/ml), median (IQR) | 54.0 (30.5-76.2) | 43.0 (25.7-66.7) | 0.792 |
| ALT (U/ml), median (IQR) | 41.5 (25.9-98.2) | 51.5 (25.0-81.7) | 0.792 |
| Pre-operative diagnosis of Mirizzi’s syndrome, n (%) | 28 (87.5) | 18 (69.2) | 0.088 |
| Presence of CBD stone | 6 (18.7)  | 15 (57.7)  | 0.002 |
| Pre-operative stenting, n (%) | 13 (40.6) | 11 (42.3) | 0.554 |
| MC Sherry’s, n (%)     |           |            |       |
| Type 1                  | 18 (56.2)| 13 (50)    | 0.635 |
| Type 2                  | 14 (43.8)| 13 (50)    |       |
| Cesendes                |           |            |       |
| Type 1, n (%)           | 18 (56.2)| 13 (50)    | 0.635 |
| Type 2, n (%)           | 10 (31.3)| 11 (42.3)  |       |
| Type 3, n (%)           | 4 (12.5) | 2 (7.7)    |       |

SD: Standard deviation, IQR: Interquartile range, CBD: Common bile duct, Hb: Haemoglobin, TLC: Total leucocyte count, RBS: Random blood sugar, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, ALP: Alkaline phosphatase, LAP: Laparoscopic
Table 2: Comparison of operative details and post-operative outcome between laparoscopic and open group

| Operative procedures                  | LAP (n=32) | Open (n=26) | P     |
|--------------------------------------|------------|-------------|-------|
| Sub-total CCX, n (%)                 | 21 (66.5)  | 6 (23.0)    | 0.009 |
| Sub-total CCX + CBDE, n (%)          | 11 (34.4)  | 18 (69.4)   |       |
| RYHJ, n (%)                          | 00 (0)     | 1 (3.8)     |       |
| Radical CCX, n (%)                   | 00 (0)     | 1 (3.8)     |       |
| Surgery time in min, median (IQR)    | 120 (120-150) | 120 (97.5-180) | 0.767 |
| Blood loss (ml), median (IQR)        | 45 (25-57.5) | 70 (47.5-150) | 0.048 |
| Post-operation stay in days, mean±SD| 4.5±3.7    | 8.1±7.8     | 0.027 |
| Post-operation complication          |            |             |       |
| Clavein-Dindo                        |            |             |       |
| Type 1, n (%)                        | 5 (15.6)   | 7 (26.9)    | 0.355 |
| Type 2, n (%)                        | 1 (3.1)    | 3 (11.5)    |       |
| Type 3, n (%)                        | 1 (3.1)    | 1 (3.8)     |       |
| Individual complications             |            |             |       |
| SSI, n (%)                           | 5 (15.6)   | 6 (23.0)    | 0.5172|
| Biliary leak, n (%)                  | 00 (0)     | 4 (15.3)    | 0.042 |
| Retained CBD stone, n (%)            | 1 (3.1)    | 00 (0)      | 1.000 |
| Paralytic ileus, n (%)               | 1 (3.1)    | 00 (0)      | 1.000 |
| Prolonged drain                      | 00 (0)     | 1 (3.8)     | 0.448 |
| output (serous)                      |            |             |       |
| Required reoperation, n (%)          | 1 (3.1)    | 1 (3.8)     | 0.881 |
| Histopathology                       |            |             |       |
| Acute on chronic cholecystitis, n (%)| 2 (6.2)    | 1 (3.8)     |       |
| Chronic cholecystitis, n (%)         | 24 (75.0)  | 18 (69.3)   | 0.721 |
| Xanthogranulomatous cholecystitis, n %| 6 (18.7)   | 7 (26.9)    |       |
| Follow-up in months, median (IQR)    | 50 (37-60) | 38 (22-57)  | 0.189 |

CBD: Common bile duct, SD: Standard deviation, IQR: Interquartile range, CCX: Cholecystectomy, CBDE: Common bile duct exploration, SSI: Surgical site infection, RYHJ: Roux−en Y Hepaticojejunostomy

risk of uncontrolled fistula in these patients, repair over a stent (‘t’-tube) was recommended.[8,10] Relatively high incidence of bile leak and wound infection in OG was may be due relatively prolonged period of contamination occurred during bile duct exploration in OG. Incidence of other complications was also higher in OG, but it was not statistically significant. The reported complication rate in the literature varies from 0% to 100% and an inverse relationship between pre-operative diagnosis and post-operative complications is also reported.[2,4,11-14] Pre-operative diagnosis of MS helps in patient selection and better surgical planning. In contrast, uncertainty in diagnosis and intraoperative surprises not only increase conversion rate but may also increase complication rate.[2,11-14]

Patients in LG had significantly shorter hospital stay than OG, and this was also comparable to the earlier reports.[2,7,11,12] In select patients, laparoscopic approach may help to reduce surgical blood loss and hospital stay which may improve cost-effectiveness and patient satisfaction level. As a policy, we prefer not to do laparoscopic surgery in patients with bide duct stones; to ensure patient safety we also practice a low threshold for conversion to open method; this may also be a reason for heterogeneous patient population and a high conversion rate in our study. Intra-cholecystic approach is associated with a risk of bile and stone spill which may result in contamination of the abdominal cavity and wound. In patient with unsuspected GBC, it may result in dissemination of an otherwise potentially curable malignancy.[7,15,16] The risk of contamination and dissemination is relatively high in laparoscopic approach; therefore, all patients of suspected GBC who present with a history of jaundice and/or associated bile duct stones and/or MS are considered for open surgery. Intraoperative frozen biopsy should be done in all the patients with suspicion of GBC, and in case of confirmed malignancy extended cholecystectomy should be performed in the same sitting.

To our best of our knowledge, this is the first study to compare laparoscopic and open surgical approach in patients with MS. As apparent from above discussion, laparoscopic management may reduce complication rate, surgical blood loss and post-operative hospital stay; however, a randomised control trial with homogeneous patient population may further confirm observations of our study.

CONCLUSION

The results of laparoscopic surgery in patients with Mirizzi’s syndrome are not inferior to that of open surgery; rather it may help to improve perioperative outcome in selected patients.

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Conflicts of interest

There are no conflicts of interest.

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