



ORIGINAL RESEARCH PAPER

Surgery

A DUSTED INDICATION FOR PROPHYLACTIC CHOLECYSTECTOMY AND YET FREQUENTLY CONSIDERED A SIGNIFICANT RISK FACTOR FOR DIFFICULT CHOLECYSTECTOMY: DM AND FATTY LIVER, SHOULD BE FOCUSED AGAIN AS AN INDICATION FOR PROPHYLACTIC CHOLECYSTECTOMY. A SHORT TERM FOLLOW UP STUDY OF LAPAROSCOPIC RECONSTITUTING SUBTOTAL CHOLECYSTECTOMY

KEY WORDS:

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ABSTRACT

Background: Laparoscopic subtotal cholecystectomy has vital benefit in preventing severe bile duct injuries and outweighs the morbidity associated with subtotal gall bladder removal in certain circumstances. **Methods:** We evaluated the 81 patients who underwent Laparoscopic Reconstituting Subtotal cholecystectomy during July 2019 to Jan 2022. Preoperative parameters (Age, Gender, DM, Smoking, Alcohol, Fatty Liver) and postoperative parameters (Duration of surgery, Hospital Stay, Postoperative Bile leak, Postoperative ERCP stenting, retained stone, Mortality) were compared. Aim of the study was to evaluate outcome of the surgery and to identify the risk factors of bile leak. **Results:** Bile leak occurred in 5 patients (6.2%). All patient who had bile leak had fatty liver (p = 0.019, chi square test). Four out of five patients were diabetic (p = 0.079, χ^2 test). Four of five patients who had leak were above 50 yrs. of age group (P= 0.517, chi square test). Mean duration of surgery was higher for both Diabetic patients and Fatty liver patients, but statistically significant results were seen for Diabetics only (T test p=0.008). **Conclusion:** Laparoscopic reconstituting Subtotal Cholecystectomy is safe approach for the difficult cholecystectomy and with minimal/no risk of retained stones. Diabetes mellitus and fatty liver are the risk factors to predict difficult cholecystectomy and we suggest the need for reconsideration of the recommendation for prophylactic cholecystectomy in diabetic patients with Asymptomatic cholelithiasis.

INTRODUCTION

Laparoscopic cholecystectomy (LC) is considered the 'gold standard' intervention for gall bladder (GB) diseases. However, the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) mentioned that since the introduction of laparoscopic cholecystectomy, bile duct injury rates have increased. In the current era of Laparoscopic advances, bile duct injuries are occurring in about 3 per 1000 procedures. Hence, achieving Strasburg critical view of safety is utmost important to avoid biliary or vascular injuries before proceeding for clipping of structures.

However, achieving Critical view of safety is not possible in all cases and there is increased incidence of biliary or vascular injury even with open approach in some cases due to extensive inflammation and adhesion. It is safe to consider the option of Partial or Subtotal cholecystectomy for these scenarios instead of landing in catastrophic injuries.

Although, bile leak rates might be higher in Subtotal cholecystectomy, morbidity associated with the procedure is moderate only and its vital benefit of lowering the risk of catastrophic bile duct injuries outweighs the post-operative morbidity.

We present our technique of laparoscopic subtotal reconstituting cholecystectomy, with a positive short-term outcome.

PATIENTS AND METHODS

This is a retrospective study of collected data from 81 patients who underwent cholecystectomy in Government Royapettah Hospital & Kauvery Hospital from July 2019 to Jan 2022

Aim Of The Study

- To evaluate the outcome of subtotal reconstituting laparoscopic cholecystectomy.
- To identify the perioperative risk factors and management of bile leak after laparoscopic subtotal

reconstituting cholecystectomy

Inclusion Criteria:

- All patients undergone Laparoscopic subtotal reconstituting cholecystectomy

Exclusion Criteria:

- Suspected Malignancy
- ECOG PS > 2
- Not fit for general Anesthesia

Patient demographic details were noted and outcome parameters were noted and tabulated.

Preoperative Parameters:

1. Age
2. Gender
3. DM
4. Smoking
5. Alcohol
6. Fatty Liver

Postoperative Parameters

1. Duration of surgery
2. Hospital Stay
3. Postoperative Bile leak
4. Postoperative ERCP stenting
5. Retained stone
6. Mortality

Standardization: Technique Of Surgery

Standard 4 port approach used in all patient. Adhesions released up to the level of Hartmann's pouch. Dissection of the calots triangle attempted. If not possible, transverse slit made in the fundus of the gall bladder and the contents aspirated. A longitudinal slit made on the free surface of the GB up to the level of Hartmann's, stones removed using stone forceps. Transverse cut made in the posterior wall of the GB at the level of Hartmann's and the posterior wall of the GB dissected of the

liver for few mm towards the calots region so as to facilitate suturing. Free flow of bile from within the cystic duct opening which is visualized through the opening in the GB is ensured. The remnant GB is closed using 2/0 vicryl or 3/0 v-lock suture. 24G DT placed near the remnant GB. Rest of the specimen stripped from the liver using a combination of monopolar and bipolar cautery and retrieved in piecemeal manner using endobag.

Statistical Analysis

Data were collected from all patients and tabulated. Confidence interval of 95 % and p value of 0.05 or less was considered for statistical significance. Categorical data were expressed as numbers and percentages. Categorical data were analyzed by Chi square test. Pearson correlation test used to check two continuous normally distributed variables exhibiting linear correlation. Descriptive statistics for continuous data included median, mean, range, and standard deviation were used. ANOVA test and T test were used for comparing continuous variable.

RESULTS

A Total of 81 patients underwent Laparoscopic subtotal cholecystectomy and none of the patient needed conversion to an open procedure. Mean age of the study population was 53.36 with SD 15.65. Patients who were diabetic had Mean age of 58.9 while nondiabetic patients had mean age of 49.4 and the difference was statistically significant (T test, p=0.006). Demographic details of the patients are illustrated in Table 1.

Table 1: Patient Demographics

Patient Demographics		
Gender	Male	54 (66.7%)
	Female	27 (33.3%)
DM	Yes	34 (42%)
	No	47 (58%)
Alcoholic	Yes	22 (27.2%)
	No	59 (72.8%)
Smoker	Yes	14 (17.3 %)
	No	67 (82.7 %)
Fatty Liver	Yes	40 (49.4%)
	No	41 (50.6%)

42% of the population were known diabetic on treatment and 49.4% population had fatty liver features on ultrasound imaging, and patients with diabetes had higher risk of fatty liver (p=0.001, χ^2 test) . Mean age of patients with diabetes is significantly higher than non-diabetic, (p=0.006T test)

However, in our study nonalcoholics found to be having more risk of fatty liver (p<0.001, χ^2 test). There was no statistically significant relation from Alcohol intake to DM (p=0.162, χ^2 test).

Mean duration of surgery was 81.35 mins (SD 20.75). On Linear graph plot, Duration of surgery increase with age, but Pearson correlation was insignificant [p=0.228]. [Figure 1, Table 2]

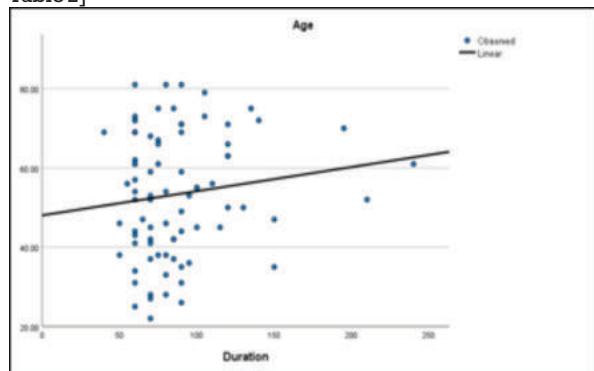


Figure 1: Linear Graph Plot - Age & Duration of surgery

Table 2: Pearson Correlations Age – Duration of Surgery

Pearson Correlations Age – Duration of Surgery			
		AGE	DURATION
AGE	Pearson Correlation	1	.135
	Sig. (2-tailed)		.228
	N	81	81
DURATION	Pearson Correlation	.135	1
	Sig. (2-tailed)	.228	
	N	81	81

Mean Duration of surgery for male patients was 35.85 mins while for female patients was 33.32 mins. (T test p=1.00). Mean duration of surgery was higher for both Diabetic patients and Fatty liver patients, but statistically significant difference could be established for Diabetics only (T test p=0.008). Also, the mean duration of surgery was higher for alcoholics (92.50 mins) compared to non-alcoholics (85.51 mins) but the statistical significance could not be established (T test p=0.425). Similarly mean duration of surgery for smokers were higher than nonsmokers but no statistically significant results were seen. [Table 3]

Table 3: Patient Factors Correlation With Duration Of Surgery

DM and Duration of Sx				
	N	Duration of Sx	Std. Deviation	P value
Diabetic	34	99.26	42.855	=0.008
Non Diabetic	47	78.83	24.742	[T test]
Fatty Liver and Duration of Sx				
	N	Duration of Sx	Std. Deviation	P value
Fatty Liver	40	88.50	33.802	p=0.782
No Fatty Liver	41	86.34	36.177	[T test]
Alcohol and Duration of Sx				
	N	Duration of Sx	Std. Deviation	P value
Alcoholic	22	92.50	45.923	p=0.425
Non Alcoholic	59	85.51	29.924	[T test]
Smoking and Duration of Sx				
	N	Duration of Sx	Std. Deviation	P value
Smoker (+)	14	100.71	54.837	p=0.117
Non-Smoker (-)	67	84.63	28.845	[T test]

Bile leak occurred in 5 patients (6.2%). Bile leak patients had longer hospital stay (Mean 10.6 days, SD 2.608) compared to rest of the patients (mean 6.11 days, SD 1.984) and difference was statistically significant (p<0.001, ANOVA) [Figure 2].

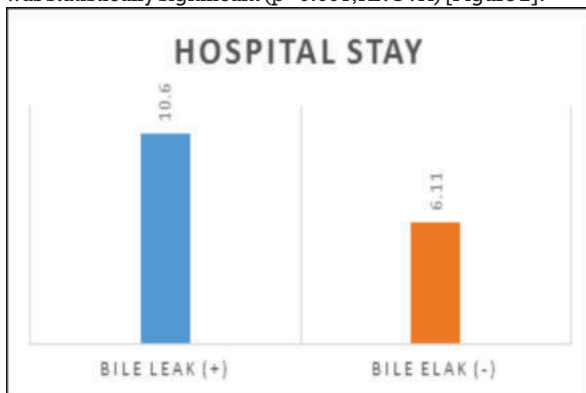


Figure 2: Correlation Of Bile Leak With Hospital Stay

All patient who had bile leak had fatty liver (p = 0.019, χ^2 test) [Table 3]. Four out of five patients were diabetic (p = 0.079, χ^2 test). Four of five patients who had leak were above 50 yrs of age group (P= 0.517, χ^2 test). Patient with bile leak had longer duration of surgery, however difference was not statistically significant (ANOVA, p=0.330)

Table 4: Fatty Liver And Bile Leak Risk

	Bile leak (+)	Bile leak (-)	P value
Fatty Liver	5	35	=0.019, χ^2 test
No Fatty Liver	0	41	

There was no statistically significant correlation between bile leak and other patient parameters like Alcohol ($p = 0.088$, χ^2 test) and smoking ($p = 0.165$, χ^2 test). Two patients who had bile leak needed ERCP stenting to control the biliary fistula.

Subgroup analysis of 5 patients who had bile leak were done to identify risk factors for patient needing ERCP stenting to control bile leak. Higher the duration of surgery and higher the age of patient more likely to need ERCP stenting. Both the patient who needed ERCP intervention were Diabetic and nonsmoker [Table 5]. Patient who underwent ERCP intervention had longer hospital stay.

Table 5: Subgroup Analysis Of Patients Whom Had Bile Leak

	N	Duration of Sx	Std. Deviation	P value
ERCP (+)	2	105.0	21.21320	=0.239
ERCP (-)	3	80.0	17.32051	[T test]
Subgroup bile leak patients				
	N	Age (yrs)	Std. Deviation	P value
ERCP (+)	2	67.5000	2.12132	p=0.404
ERCP (-)	3	54.3333	18.14754	[T test]
Subgroup bile leak patients				
	N	Hospital stay	Std. Deviation	P value
ERCP (+)	2	12.5000	3.53553	p=0.221
ERCP (-)	3	9.3333	1.15470	[T test]

Mean Hospital Stay of the patients were 6.38 days (SD 2.283). Patient with Bile leak had longer hospital stay and also patient who had diabetes and fatty liver had statistically significant longer hospital stays ($p < 0.001$ [T test], $p = 0.010$ [T test], $p = 0.020$ [T test] respectively) [Figure 3 & 4]

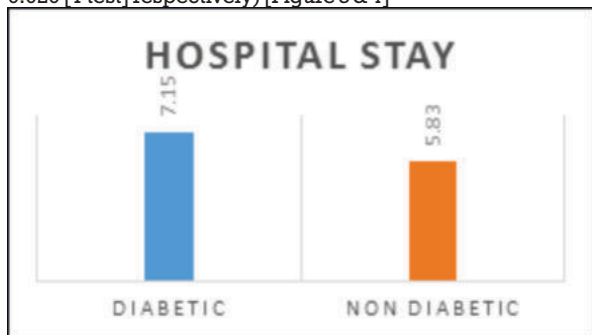


Figure 3: Correlation of DM and Hospital Stay



Figure 4: Correlation Of Fatty Liver And Hospital Stay

Patients who were above 50 years of age had longer hospital stay (Mean=6.71 days, SD 2.564) compared to those who were below 50 years (Mean 5.97 days, SD 1.828), ($p = 0.149$, ANOVA) and Linear graph plot showed as age increased duration of hospital stay increased but Pearson correlation was not significant ($p = 0.101$) [Figure 6 & Table 10].

Somehow the duration of surgery was not related to the hospital stay duration according to Pearson correlation test ($p = 0.856$) [Figure 5]

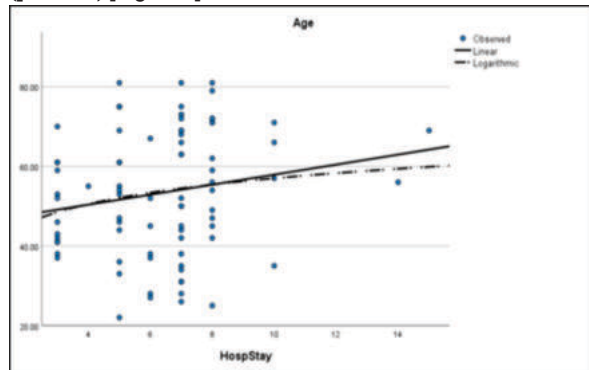


Figure 5: Linear Graph Plot - Age With Hospital Stay

Patient with Alcohol intake history had longer hospital stay (Mean 6.82 days SD 2.872) compared to non-alcoholic (Mean 6.22 days SD 2.026), but it was not statistically significant ($p = 0.298$, T test). There was no statistically significant relation between hospital stay and patient gender ($p = 0.733$, T test). None of the patient has retained stones in follow up imaging.

DISCUSSION

Laparoscopic cholecystectomy is a standard procedure with well established benefits and rapid patient recovery. However, despite all benefits bile duct injuries have increased and occur more commonly when operations are made more difficult due to the presence of severe acute and/or chronic inflammation. It is commendable when surgeon come to a conclusion to not proceed with total cholecystectomy and it is wise to go for a bail out procedure rather than leaving with some catastrophic injury. Two of the most useful "bail out" procedures: partial cholecystectomy and subtotal cholecystectomy are not clear and well-defined operations.

Lerner described the technique of partial cholecystectomy in 1950, in which three-quarters of the gallbladder was removed and a portion of the gall bladder posterior wall left attached to the liver and the mucosa was not electro-coagulated and the cystic duct was not closed. In 1985, the subtotal cholecystectomy technique was modified: the posterior wall of the gallbladder was left attached to the liver, and the cystic duct was closed with a purse-string technique. Currently, the most reputed method to solve this problem is subtotal cholecystectomy removing both the anterior and posterior walls with suturing of the infundibulum. This method is reported for open, open converted or laparoscopic procedures. However terminology is confusing in the literature and that's why partial cholecystectomy term is obsolete and depending on the gall bladder remnant produced or not subtotal cholecystectomy will be called fenestrating (no gallbladder remnant produced) and reconstituting (gallbladder remnant produced).⁹

Incidence of bile leak, Subhepatic or subphrenic collection and SSI is higher in fenestrating cholecystectomy. Theoretically, the presence of a closed gallbladder remnant should increase the risk of developing recurrent gallstones; however, the results from the systematic review by Jonathan et al in 2020 (39 studies with 1784 cases) showed a similar risk of symptomatic gallbladder remnant from either an open or closed gallbladder remnant.

Our technique of dividing gall bladder wall with a longitudinal slit made on the free surface of the GB up to the level of Hartmann's provides clear inside view and allow for retrieval of stones and also vital structures could be preserved because dissection is well away from the calots.

Preoperative prediction of patients at increased risk of conversion to open cholecystectomy has several potential advantages. Low risk patients could be identified and appropriately scheduled in an ambulatory care facility, and selected as training cases for surgical trainees, whilst high risk patients should be appropriately counselled and operated by experienced surgeons.

The predictors of difficult cholecystectomy are usually considered male sex, age, obesity, liver cirrhosis, adhesions from previous upper abdominal surgery, anatomic variation, and surgical experience.

Cirrhosis is an established risk factor for difficult cholecystectomy, but fatty liver is usually not considered in the most of the studies. In our study we could establish that fatty liver is one of the risk factors for difficult cholecystectomy and fatty liver patients have high risk of post operative bile leak.

Another factor which has been discussed in detail in the literature and not yet included as an indication for prophylactic cholecystectomy is Diabetes mellites. But still many surgeons continue to believe that, it is wise to go for prophylactic cholecystectomy in Diabetic patients with asymptomatic cholelithiasis. And most of them have this principle because of fear of having more complicated cholecystitis and difficult cholecystectomy in diabetic patients. In Our study also we could establish that DM patient needs longer duration of surgery and longer hospital stay.

CONCLUSION

Laparoscopic reconstituting Subtotal Cholecystectomy is safe approach for the difficult cholecystectomy and with minimal/no risk of retained stones. Diabetes mellites and fatty liver are the risk factors to predict difficult cholecystectomy and we suggest the need for reconsideration of the recommendation for prophylactic cholecystectomy in diabetic patients with Asymptomatic cholelithiasis.

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