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EVALUATION OF FUNDUS FIRST LAPAROSCOPIC CHOLECYSTECTOMY IN OBSCURED CALOT'S TRIANGLE

General Surgery

Dr. Shubham Sharma PGJR3, Department of General Surgery, Hind Institute of Medical Sciences, Barabanki, Uttar Pradesh, India

Dr. Vijay Kumar Goel* Professor and Head of Department of General Surgery, Hind Institute of Medical Sciences, Barabanki, Uttar Pradesh, India*Corresponding Author

Dr. Prashant Pandey Professor, Department of General Surgery, Hind Institute of Medical ScIences, Barabanki, Uttar Pradesh, India

ABSTRACT

Introduction: Obscured Calot's triangle is a contraindication for conventional laparoscopic cholecystectomy in routine clinical practice. To assess the feasibility of fundus-first approach to perform laparoscopic cholecystectomy (LC) in patients with obscured Calot's triangle. A total of 95 patients undergoing LC having obscure Calot's triangle, aged 17-60 years (mean age 40.31±10.92 years; 72.6% females; mean BMI 26.60±4.93 kg/m2) were enrolled in the study. Clinicodemographic, sonographic and biochemical findings were noted. All the patients were operated using Fundus first approach. Time taken for surgery was noted and intra-operative and post-operative complications were noted. Duration of hospital stay and readmission need were also noted. Different demographic, clinical and operative factors were correlated with procedure's feasibility. **Summary:** Fundus first approach was feasible in 87.4% cases. Mean duration of surgery was 102.23±44.82 minutes. Intraoperative/post-operative complications occurred in 34.7% cases. Mean duration of hospital stay was 4.97±2.48 days. A total of 8 (7.4%) patients needed readmission. Feasibility of Fundus first approach was independent of age, sex, body mass index, composition type of gallstones, symptomatic status, symptom severity, haematological and biochemical parameters, operative time and intraoperative complications. No significant association was seen between feasibility and duration of hospital stay and readmission need. The study showed that fundus first approach, in general, was feasible in cases with obscure Calot's triangle with a success rate of 87.4%.

KEYWORDS

Laparoscopic cholecystectomy, Chronic cholecystitis, Obscure Calot's triangle, Fundus first approach, Feasibility

INTRODUCTION

Cholecystectomy, or gallbladder removal surgery, is one of the most frequently performed surgical procedures worldwide [1]. The primary indication is gallstone disease, whose prevalence continues to rise. With advances in diagnostic imaging, the detection of gallstones-both symptomatic and asymptomatic—has increased significantly, leading to a growing number of cholecystectomies globally. Historically, gallbladder surgeries were conducted via open surgical methods. However, since the advent of laparoscopic cholecystectomy, this minimally invasive technique has become the gold standard for managing gallstone disease. This shift marks a significant milestone in surgical evolution. Laparoscopic cholecystectomy offers numerous advantages, including smaller incisions, minimal blood loss, less postoperative pain, quicker recovery, shorter hospital stays, and superior cosmetic outcomes [2].

A thorough understanding of surgical anatomy is essential for successful laparoscopic cholecystectomy, particularly regarding the dissection around Calot's triangle. Also known as the hepatobiliary triangle, Calot's triangle is a vital anatomical landmark bordered inferiorly by the cystic duct, medially by the common hepatic duct, and superiorly by the liver's inferior surface. This region houses critical structures such as the cystic artery and lymph nodes, including the node of Lund. Precise identification and dissection in this area are essential to avoid complications, particularly bile duct injuries (BDIs), which are among the most serious risks of the procedure [3]. However, dissection within Calot's triangle is not always feasible, especially in cases of dense adhesions or severe inflammation. In such scenarios, alternative techniques are necessary to ensure a safe surgical outcome without increasing the risk of complications [4].

Fundus-First Approach for Obscured Calot's Triangle

The fundus-first (retrograde) approach involves grasping the gallbladder fundus and proceeding with dissection toward the infundibulum, where the cystic duct and artery are eventually isolated, secured, and divided. This technique avoids the need for initial dissection in Calot's triangle, making it particularly useful when access is hindered. By bypassing dense adhesions or inflamed tissues, the fundus-first approach significantly reduces the risk of BDIs [5]. The present study aims to evaluate the efficacy of this technique in cases where Calot's triangle is obscured.

MATERIALS AND METHODS

This "prospective observational study was conducted in the Department of General Surgery, Hind Institute of Medical Sciences, Barabanki, over a period of 18 months, including 12 months of patient enrollment and 6 months of data" analysis. A total of 95 patients aged 14–60 years undergoing laparoscopic cholecystectomy were included if intraoperative findings revealed an obscured Calot's triangle. Patients with clearly visible Calot's triangle or suspected gallbladder carcinoma were excluded. After obtaining informed consent, demographic details, clinical symptoms, BMI, and biochemical parameters including white blood cell count, liver function tests (serum bilirubin, ALT, ALP), and CRP were recorded.

All patients underwent the fundus-first approach for laparoscopic cholecystectomy, where dissection was initiated at the gallbladder fundus and proceeded toward the infundibulum. Intraoperative data including operative time and complications were documented. Postoperative outcomes such as duration of hospital stay and readmission were also noted. Conversion to open surgery was considered a failure of the fundus-first approach. Data were analyzed using standard statistical methods, with categorical variables presented in percentages and continuous variables as mean ± SD. A p-value < 0.05 was considered statistically significant.

RESULT AND ANALYSIS

This study evaluated the feasibility and surgical outcomes of fundus-first laparoscopic cholecystectomy in cases with obscured Calot's triangle, enrolling 95 eligible patients who met the inclusion criteria for the procedure.

Table 1: Age Profile of Patients Enrolled in the study (n=95)

SN	"Age Group	No. of cases	Percentage
1.	≤20 Years	4	4.2
2.	21-30 Years	18	18.9
3.	31-40 Years	19	20.0
4.	41-50 Years	33	34.7
5.	51-60 Years	21	22.1
Mean age±SD (Range) in years	40.31±10.92 (17-60)"		

Table 2: Sex Profile of Patients "Enrolled in the study (n=95)

SN	Sex Profile	No. of cases	Percentage

1.	Male	26	27.4
2.	Female	69	72.6
Sex ratio (M:F)		0.	38

Table 3: Distribution of patients according to body mass index profile" (BMI)

SN	BMI	No. of cases	Percentage
1.	"Underweight (<18.5 kg/m²)	4	4.2
2.	Normal weight (18.5-24.9 kg/m²)	36	37.9
3.	Overweight (25.0-29.9 kg/m²)	29	30.5
4.	Obese (≥30 kg/m²)	26	27.4
Mean BMI±SD (Range) kg/m²		26.60±4.93 (18.1-34.8)"	

Table 4: Hematological and Biochemical Profile

SN	Parameter	Mean	SD	Range	
				Minimum	Maximum
1.	WBC (thousands/cumm)	9.41	3.15	4.2	15.0
2.	S. Bilirubin (mg/dl)	2.06	1.05	.2	3.9
3.	S. ALT (IU/L)	99.15	55.14	10.0	199.0
4.	S. ALP (IU/L)	158.78	71.47	30.0	296.0
5.	CRP (mg/L)	27.91	12.89	1.8	49.4

Table 5: Presenting complaints and symptom severity

SN	Variable	No. of cases	Percentage
A.	Presenting complaints		
1.	Asymptomatic	16	16.8
2.	Symptomatic	79	83.2
	Right upper quadrant pain	25	26.3
	Jaundice	23	24.2
	Fever	17	17.9
	Nausea and vomiting	14	14.7
3.	Symptom severity		
	Mild	42	44.2
	Moderate	24	25.3
	Severe	29	30.5

Table 6: Distribution of cases according to intraoperative and post-operative complications

SN	Complications	No. of cases	Percentage
1.	No complications	62	65.3
2.	Complications	33	34.7
	Bleeding	12	12.6
	CBD Injury	8	8.4
	Bile leak	7	7.4
	Infection	6	6.3

Table 7: Distribution of cases according to conversion to open surgery

SN	Conversion to open surgery	No. of cases	Percentage
1.	No conversion	83	87.4
2.	Conversion	12	12.6

Table 8: Factors associated with Feasibility (conversion to open surgery)

SN	Characteristic	Not feasible (n=12)	Feasible (n=83)	Statistical significance
1.	Mean age±SD (Years)	42.92±10.31	39.93±11.01	t=0.885; p=0.378
2.	Female sex	10 (83.3%)	59 (71.1%)	2=0.791; p=0.374
3.	BMI>25 kg/m²	9 (75.0%)	46 (55.4%)	2=0.364; p=0.546
4.	Gallstone type			
	Cholesterol	2 (16.7%)	26 (31.3%)	2=2.351; p=0.309
	Pigment	6 (50.0%)	24 (28.9%)	
	Mixed	4 (33.3%)	33 (39.8%)	
5.	Symptomatic status	12 (100%)	67 (80.7%)	2=2.782; p=0.095
6.	Severe symptoms	5 (41.7%)	24 (28.9%)	2=0.804; p=0.370
7.	Mean WBC±SD	10.52±3.13	9.26±3.14	t=1.300; p=0.197
8.	TSB±SD (mg/dl)	2.00±0.80	2.07±1.09	t=0.199; p=0.842
9.	S. ALT±SD (IU/L)	114.42±36.45	96.94±57.17	t=1.026; p=0.307
10.	S. ALP±SD (IU/L)	139.92±71.23	161.51±71.52	t=0.978; p=0.331
11.	CRP±SD (mg/L)	32.58±12.83	27.24±12.84	t=1.349; p=0.181
12.	Operative time±SD (min)	96.08±42.00	103.12±45.39	t=0.506; p=0.614
13.	Intraoperative complications	5 (41.7%)	28 (33.7%)	2=0.291; p=0.590
14.	Hospital stay >5 days	8 (66.7%)	43 (51.8%)	2=0.931; p=0.335
15.	Readmission	1 (8.3%)	7 (8.4%)	2=0.000; p=0.991

None of the studied factors had a significant association with feasibility (p>0.05).

DISCUSSION

In situations where Calot's triangle is obscured due to inflammation or adhesions, the conventional laparoscopic approach becomes risky, often prompting conversion to open surgery. This study demonstrated that the fundus-first approach offers a safe and viable alternative in such cases. With a feasibility rate of 87.4%, most patients undergoing this technique were successfully managed laparoscopically [6]. The demographic profile in this study aligns with established trends, where middle-aged females represent the majority of cholelithiasis cases. A substantial portion of patients were overweight or obese, which may have contributed to obscured anatomy. The overall complication rate (34.7%) was slightly higher than reported in some other studies. Importantly, there was no significant association between procedural feasibility and patient-related variables such as age, BMI, gallstone type, or lab parameters. Conversion to open surgery was required in 12.6% of cases [7], a figure consistent with prior research involving complex laparoscopic cholecystectomy cases. While the fundus-first approach proved to be generally safe and effective. Further large-scale comparative studies are warranted [8].

CONCLUSION

This prospective study evaluated the fundus-first laparoscopic cholecystectomy technique in patients with an obscured Calot's triangle. Among the 95 patients included, the approach was feasible in 87.4% of cases. The mean operative time was approximately 102 minutes, and intraoperative or postoperative complications occurred in about one-third of the cases. The conversion to open surgery was required in 12.6% of patients, aligning with findings from previous literature on complex cholecystectomy cases. Average hospital stay was nearly five days, and readmission occurred in 8.4% of patients. Importantly, none of these factors demonstrated a significant correlation with procedural failure. Overall, the findings indicate that the fundus-first approach is a reliable and safe alternative for managing cases where the Calot's triangle is not clearly identifiable. It minimizes the risk associated with early dissection near critical structures and allows for laparoscopic completion in most instances. Future studies with larger populations and comparative arms are encouraged to further validate these results and explore broader clinical applications.

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