

Comparative Analysis of Intraoperative Findings During Elective Laparoscopic Cholecystectomy in Diabetic and Nondiabetic Patients

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Abstract:

Background: Laparoscopic cholecystectomy (LC) is the standard treatment for symptomatic gallstone disease. Diabetes mellitus (DM) is a common comorbidity in patients undergoing LC and is associated with increased intraoperative difficulty and postoperative complications. Understanding the impact of diabetes on surgical outcomes is crucial for optimizing perioperative management.

Aim: To compare intraoperative findings and surgical outcomes of elective laparoscopic cholecystectomy in diabetic and nondiabetic patients.

Methods: A prospective comparative study was conducted at Narayan Medical College and Hospital over 6 months, including 148 patients undergoing elective LC (74 diabetics and 74 nondiabetics). Preoperative demographic and clinical data were collected. Intraoperative findings such as gallbladder inflammation, adhesions, difficulty in Calot's triangle dissection, operative time, and complications were documented. Postoperative outcomes including pain, hospital stay, and early complications were analyzed. Data were analyzed using SPSS version 23.0. Continuous variables were expressed as mean \pm SD, and categorical variables as percentages. Comparative analysis was performed using Student's t-test and Chi-square test; $p < 0.05$ was considered statistically significant.

Results: Diabetic patients had significantly higher BMI and comorbidities, including hypertension and dyslipidemia. Intraoperative findings revealed higher rates of gallbladder inflammation (62.2% vs 37.8%, $p=0.003$), adhesions (51.4% vs 27.0%, $p=0.004$), and difficulty in Calot's triangle dissection (43.2% vs 20.3%, $p=0.002$) among diabetics. Operative time was longer in diabetics (82.5 ± 15.6 min vs 70.3 ± 12.8 min, $p<0.001$). Postoperative hospital stay (3.8 ± 1.2 days vs 2.9 ± 0.9 days, $p<0.001$) and pain scores (VAS 4.2 ± 1.1 vs 3.5 ± 0.9 , $p=0.001$) were also significantly higher in diabetics. Conversion to open surgery and intraoperative complications were slightly higher in diabetics but not statistically significant.

Conclusion: Diabetes is associated with increased intraoperative difficulty, higher rates of adhesions and inflammation, longer operative times, and slightly delayed postoperative recovery in elective laparoscopic cholecystectomy.

Recommendations: Preoperative assessment of diabetic patients should include careful evaluation of comorbidities and potential surgical difficulties. Surgeons should anticipate intraoperative challenges and plan perioperative care accordingly to minimize complications and optimize outcomes.

Keywords: Diabetes mellitus, Laparoscopic cholecystectomy, Intraoperative findings, Surgical difficulty, Postoperative outcomes

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Introduction

LC) has become the gold standard for treating symptomatic gallstone disease due to its minimally invasive nature, leading to reduced postoperative pain, shorter hospital stays, and quicker recovery times [1]. However, the presence of (DM),

particularly type 2, introduces unique challenges that may affect surgical outcomes. Diabetes is a prevalent comorbidity in patients undergoing LC and has been associated with increased

intraoperative difficulties and postoperative complications [2].

In diabetic patients, chronic hyperglycemia leads to microvascular changes, impaired immune response, and delayed wound healing, all of which can complicate surgical procedures [3]. Studies have demonstrated that diabetic individuals undergoing LC experience higher rates of intraoperative complications, including increased adhesions, thicker gallbladder walls, and a higher incidence of gangrenous cholecystitis [4]. These factors contribute to longer operative times and a higher likelihood of conversion to open surgery. Additionally, postoperative recovery in diabetic patients is often prolonged, with increased risks of infections and delayed healing [5].

The Tokyo Guidelines 2018 introduced the Surgical Difficulty Score (TGDS18), a tool designed to assess the complexity of LC procedures based on intraoperative findings [2]. This scoring system has been shown to correlate with operative time, blood loss, and hospital stay, providing a quantifiable measure to predict surgical difficulty. Factors such as pericholecystic inflammation, calcified stones, and anatomical variations are considered in this scoring system, which can aid in preoperative planning and risk assessment [3].

Despite advancements in surgical techniques and perioperative care, diabetic patients continue to face higher risks during LC. Therefore, it is imperative to understand the specific intraoperative challenges posed by diabetes to optimize surgical strategies and improve patient outcomes. This study aims to compare the intraoperative findings and surgical outcomes of elective laparoscopic cholecystectomy in diabetic and nondiabetic patients, providing insights that could inform clinical practices and enhance patient care [5].

References

Methodology

Study Design: This study was designed as a prospective comparative observational study.

Study Setting: The study was conducted at Narayan Medical College and Hospital, over a duration of 6 months.

Study Participants: A total of 148 patients undergoing elective laparoscopic cholecystectomy were included in the study. These patients were categorized into two groups: diabetic and nondiabetic, based on their medical history and laboratory findings.

Inclusion Criteria

- Adult patients aged between 18 to 70 years undergoing elective laparoscopic cholecystectomy.

- Diagnosed cases of cholelithiasis.
- Patients with well-controlled diabetes (for the diabetic group).
- Patients willing to provide informed consent.

Exclusion Criteria

- Patients undergoing emergency laparoscopic cholecystectomy.
- Patients with known coagulopathy or severe cardiopulmonary disease.
- Patients with acute cholecystitis or gallbladder malignancy.
- Patients with previous upper abdominal surgery.
- Uncontrolled diabetics (HbA1c > 8.0%) or severe systemic comorbidities.

Bias: To minimize selection bias, consecutive sampling was used for enrolling patients who met the inclusion criteria during the study period. Standardized protocols were followed for intraoperative assessment, and all procedures were performed by experienced surgeons to reduce observer bias.

Data Collection: Preoperative data such as age, sex, BMI, duration of diabetes, glycemic control (HbA1c), and other comorbidities were recorded. Intraoperative findings, including gallbladder inflammation, adhesions, difficulty in dissection, bile duct injury, and operative time, were carefully documented using a structured proforma.

Procedure: All patients underwent elective laparoscopic cholecystectomy under general anesthesia following standard surgical protocols. Intraoperative findings were systematically recorded by the operating surgeon. Special attention was given to any difficulties encountered during the procedure, anatomical variations, and the presence of adhesions or complications.

Statistical Analysis: Collected data were entered into Microsoft Excel and analyzed using SPSS version 23.0. Continuous variables were expressed as mean \pm standard deviation, and categorical variables were expressed as percentages. Comparative analysis between the diabetic and nondiabetic groups was performed using the Student's t-test for continuous variables and the Chi-square test for categorical variables. A p-value <0.05 was considered statistically significant.

Results

A total of 148 patients undergoing elective laparoscopic cholecystectomy were included in the study. Among them, 74 patients were diabetic (Group A) and 74 were nondiabetic (Group B). The demographic, clinical, and intraoperative characteristics of the two groups are summarized below.

Table 1: Demographic Characteristics of Participants

Characteristic	Diabetic (n=74)	Nondiabetic (n=74)	p-value
Age (years, mean \pm SD)	52.3 \pm 9.1	48.7 \pm 10.2	0.02*
Sex (M/F)	42/32	40/34	0.71
BMI (kg/m ² , mean \pm SD)	28.5 \pm 3.6	26.4 \pm 3.1	0.001*

The diabetic group had a significantly higher mean age and BMI compared to the nondiabetic group. Sex distribution was comparable between groups.

Table 2: Comorbidities

Comorbidity	Diabetic (n=74)	Nondiabetic (n=74)	p-value
Hypertension	28 (37.8%)	12 (16.2%)	0.004*
Dyslipidemia	19 (25.7%)	8 (10.8%)	0.02*
Cardiovascular disease	8 (10.8%)	4 (5.4%)	0.23

Hypertension and dyslipidemia were significantly more prevalent in diabetic patients. Cardiovascular

disease was higher in diabetics but not statistically significant.

Table 3: Intraoperative Findings

Finding	Diabetic (n=74)	Nondiabetic (n=74)	p-value
Gallbladder inflammation	46 (62.2%)	28 (37.8%)	0.003*
Adhesions	38 (51.4%)	20 (27.0%)	0.004*
Difficulty in Calot's triangle dissection	32 (43.2%)	15 (20.3%)	0.002*
Conversion to open surgery	5 (6.8%)	2 (2.7%)	0.24
Operative time (minutes, mean \pm SD)	82.5 \pm 15.6	70.3 \pm 12.8	<0.001*

Diabetic patients had significantly higher rates of gallbladder inflammation, adhesions, and difficulty in Calot's triangle dissection. Operative time was

also significantly longer in diabetics. Conversion to open surgery was higher in diabetics, but not statistically significant.

Table 4: Intraoperative Complications

Complication	Diabetic (n=74)	Nondiabetic (n=74)	p-value
Bile spillage	6 (8.1%)	3 (4.0%)	0.32
Minor bleeding	7 (9.5%)	4 (5.4%)	0.34
Bile duct injury	1 (1.4%)	0	0.31

Intraoperative complications were slightly higher in the diabetic group, though the differences were not statistically significant.

Table 5: Postoperative Outcomes

Outcome	Diabetic (n=74)	Nondiabetic (n=74)	p-value
Postoperative hospital stay (days, mean \pm SD)	3.8 \pm 1.2	2.9 \pm 0.9	<0.001*
Postoperative pain (VAS score, mean \pm SD)	4.2 \pm 1.1	3.5 \pm 0.9	0.001*
Early postoperative infection	5 (6.8%)	2 (2.7%)	0.24

Diabetic patients experienced significantly longer hospital stays and higher postoperative pain scores. Infection rates were slightly higher in diabetics but not statistically significant.

Overall, diabetics undergoing laparoscopic cholecystectomy demonstrated greater surgical difficulty and complexity compared to nondiabetic patients.

Summary of Key Findings

- Diabetic patients were older, had higher BMI, and more comorbidities than nondiabetic patients.
- Intraoperative findings such as gallbladder inflammation, adhesions, and difficulty in dissection were significantly higher in diabetics.
- Operative time was longer in the diabetic group.
- Postoperative recovery was slightly delayed in diabetics, with higher pain scores and longer hospital stays.

Discussion

In this study of 148 patients undergoing elective laparoscopic cholecystectomy, equal numbers of diabetic (n=74) and nondiabetic (n=74) patients were evaluated for demographic, intraoperative, and postoperative outcomes. Diabetic patients were significantly older and had higher body mass index compared to nondiabetics. Additionally, comorbidities such as hypertension and dyslipidemia were more prevalent in the diabetic group, highlighting the higher baseline risk profile of these patients.

Intraoperative assessment revealed that diabetic patients had significantly higher rates of gallbladder inflammation, adhesions, and difficulty in Calot's triangle dissection. These factors contributed to longer operative times in the diabetic group compared to nondiabetics. Although conversion to open surgery and intraoperative complications such as bile spillage, minor bleeding, and bile duct injury were slightly higher in diabetics, these differences did not reach statistical significance.

Postoperative outcomes demonstrated that diabetic patients experienced longer hospital stays and higher pain scores, suggesting a slower recovery process. Early postoperative infections were slightly more common in diabetics, although this difference was not statistically significant. Overall, the results indicate that diabetes is associated with increased surgical complexity and greater intraoperative challenges during laparoscopic cholecystectomy. Surgeons should be aware of these factors during preoperative planning, patient counseling, and perioperative management to optimize surgical outcomes and reduce potential complications.

Multiple studies since 2018 have compared intraoperative findings in diabetic and non-diabetic patients undergoing laparoscopic cholecystectomy. Diabetic patients frequently present with more complicated gallbladder pathology such as gangrene, empyema, and dense adhesions, which contribute to increased operative difficulty. Raza et al. reported that diabetics had higher rates of empyema, pericholecystic adhesions, and difficult Calot's triangle dissections compared to non-diabetics, though postoperative outcomes were broadly similar [6]. Similarly, Akerele et al. noted that while mortality and morbidity rates were comparable between groups, diabetics had longer operative times and a greater frequency of conversion to open cholecystectomy due to technical difficulty [7].

Other investigations reinforce these findings. Al-Ghamdi et al. found that diabetic patients with acute cholecystitis presented later, had more severe intraoperative findings, and experienced higher complication rates compared to their non-diabetic counterparts [8]. Vetrhus et al. highlighted that diabetes was significantly associated with complicated gallstone disease and adhesions, leading to increased technical challenges during laparoscopic cholecystectomy [9]. Furthermore, Chen et al. demonstrated that diabetics showed higher inflammatory marker levels preoperatively and were more likely to develop gangrenous cholecystitis, correlating with difficult intraoperative anatomy [10].

Additional large cohort analyses supported these patterns. Singh et al. showed that diabetics had longer operative durations, higher conversion rates,

and greater intraoperative bleeding than non-diabetics [11]. Moreover, Ndirangu et al. observed increased adhesions, bile spillage, and subtotal cholecystectomy in diabetic patients, although overall recovery profiles did not significantly differ [12]. Collectively, these findings emphasize that diabetic patients undergoing laparoscopic cholecystectomy face greater intraoperative complexity, but postoperative outcomes may remain similar with appropriate surgical management.

Conclusion

Diabetic patients undergoing elective laparoscopic cholecystectomy exhibit increased intraoperative difficulty, higher rates of gallbladder inflammation and adhesions, longer operative times, and slightly prolonged postoperative recovery compared to nondiabetic patients. Awareness of these challenges can aid in better surgical planning and improved patient outcomes.

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