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Original Research Article

Study of complications and their management after biliary tract surgery: a study of 50 cases

Mohammad Khaleduzzaman Khan[1]*, Arjun Deb[1], S. M. Iftekhar Uddeen Sagar[2]

[1]Department of Surgery, Zilla Sadar Hospital Narsingdi, Bangladesh
[2]Department of Surgery, 300 Bed Hospital, Narayanganj, Bangladesh

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***Correspondence:**
Dr. Mohammad Khaleduzzaman Khan,
E-mail: khaledkhan.bs@gmail.com

ABSTRACT

Background: Post-operative complications following biliary tract surgery vary widely, and comprehensive data on their patterns, management, and outcomes remain limited, especially in resource-constrained settings. The aim of the study was to evaluate the types, clinical features, management strategies, and outcomes of complications following biliary tract surgery in 50 patients.
Methods: This prospective study at the Department of Surgery, Dhaka Medical College Hospital (DMCH), and Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh, from January 2007 to February 2008 included 50 patients with complications following biliary tract surgery, excluding combined biliary, pancreatic, or stomach procedures. Patients underwent detailed history, examination, and investigations (USG, LFT, ERCP, MRCP). Minor complications were managed conservatively, major complications surgically (Roux-en-Y hepaticojejunostomy/ choledochojejunostomy), and retained stones endoscopically, with outcomes assessed on follow-up.
Results: Among 50 patients, most were male (43, 86%) and aged 31-50 years (37, 74%). Minor bile leak (20%) and bile duct injuries (30%) were the most common complications, with jaundice (40%) as the main clinical feature. Laparoscopic cholecystectomy caused 80% of injuries. Most presented within 1 month (70%). Management included operative (40%), non-operative (34%), and endoscopic (10%) approaches, with Roux-en-Y hepaticojejunostomy being the most frequent procedure (60%). Follow-up showed recurrent cholangitis (14%) and restricture (4%).
Conclusions: Biliary tract injuries, particularly after laparoscopic cholecystectomy, remain a serious concern, with timely recognition, careful surgical technique, and Roux-en-Y hepaticojejunostomy being key to management, while prevention and vigilant long-term follow-up are essential to optimize outcomes.

Keywords: Biliary surgery, Post-operative complications, Management strategies

INTRODUCTION

Laparoscopic cholecystectomy (LC) has become the standard surgical approach for the management of symptomatic cholecystolithiasis, largely replacing the traditional open technique.[1-6] For patients with symptomatic cholelithiasis, cholecystectomy remains the definitive treatment, with the laparoscopic approach now favored in most cases of gallbladder disease because of its established benefits.[7-9] Over time, the widespread adoption of laparoscopic cholecystectomy has markedly altered the landscape of surgical management of cholelithiasis.

Despite the well-recognized advantages of minimally invasive surgery, laparoscopic cholecystectomy is associated with a distinct pattern of complications, particularly bile duct injury (BDI), which are often more severe, located proximally, and frequently accompanied

by associated vascular damage.[10] Certain complications, such as clip migration or intraperitoneal gallstone spillage, were not observed in the era of open surgery. Although both open and laparoscopic techniques are considered effective and safe, postoperative problems including retained or residual common bile duct stones, biliary stasis, and ascending cholangitis may still develop. Patients who experience BDI during cholecystectomy are known to have a reduced quality of life and a persistently higher mortality risk compared with those undergoing uncomplicated procedures.[11]

Acute or chronic inflammation has been identified as a major predisposing factor for bile leaks and severe bile duct injuries. Conversion from laparoscopic to open surgery is particularly common in cases of acute cholecystitis, where dense adhesions and distorted or atypical biliary anatomy increase technical difficulty. The most frequent clinical manifestations include jaundice and pain in the right upper quadrant, while biliary colic, gallstone pancreatitis, ascending cholangitis, and biochemical abnormalities such as elevated bilirubin and alkaline phosphatase are also frequently encountered.[12] Inadequate surgical technique or poor intraoperative judgment can result in grave outcomes, including lifelong morbidity or death.

Initial suspicion of biliary tract complications is typically based on clinical assessment and subsequently confirmed through laboratory testing, ultrasonography, magnetic resonance cholangiopancreatography (MRCP), or endoscopic retrograde cholangiopancreatography (ERCP), which also serves as a therapeutic modality.[13,14] When ERCP is unsuccessful or laparoscopic exploration of the common bile duct is not feasible, open bile duct exploration remains the definitive treatment option. Surgical management of biliary strictures may involve procedures such as Roux-en-Y hepaticojejunostomy, hepatectomy, or liver transplantation.[2,4,6] Early recognition of iatrogenic injury is critical to enable prompt surgical repair or referral to specialized hepatobiliary centers, as affected patients require prolonged and often lifelong surveillance to identify late complications, including recurrent strictures.[2,6,11]

Despite extensive literature on biliary tract surgery and its complications, there remains considerable variability in the reported patterns of presentation, diagnostic approaches, management strategies, and postoperative outcomes across different healthcare settings, particularly in resource-limited regions. Many published studies focus on isolated complications such as bile duct injury or strictures, while comprehensive evaluations encompassing the full spectrum of postoperative biliary complications and their management are limited. Furthermore, delayed presentation, constrained access to advanced diagnostic modalities, and variations in surgical expertise may significantly influence outcomes, yet these factors are underrepresented in existing data from South Asian tertiary care centers. A clearer understanding of locally encountered complication profiles and treatment outcomes is therefore essential to inform timely diagnosis, optimize management strategies, and improve patient prognosis. The purpose of the study is to evaluate the types, clinical features, management strategies, and outcomes of complications following biliary tract surgery in 50 patients.

Objective

The objective of this study was to evaluate the types, clinical features, management strategies, and outcomes of complications following biliary tract surgery in 50 patients.

METHODS

This prospective study was conducted at the Department of Surgery, Dhaka Medical College Hospital (DMCH), and Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh, between January 2007 and February 2008. A total of 50 patients with complications following biliary tract surgery were included in the study. Patients were selected from various surgical units of DMCH and BSMMU based on predefined inclusion criteria to evaluate the types, clinical features, management strategies, and outcomes of postoperative biliary complications.

Inclusion criteria

All patients presenting with complications following biliary surgery, regardless of the surgical method used were included.

Exclusion criteria

Patients who underwent combined biliary, pancreatic, and stomach surgery were excluded.

Study procedure

After enrollment, all patients underwent a detailed history taking, which included age, sex, occupation, presenting complaints, previous surgeries, and relevant family history. Comprehensive physical examinations were performed, focusing on clinical signs such as jaundice, fever, peritonitis, biliary leakage, fistula, subphrenic abscess, and other relevant findings. Preoperative evaluation included ultrasonography of the whole abdomen, liver function tests, ERCP, and MRCP, with all information recorded in a structured proforma.

Management was guided by the severity of complications. Minor complications were treated conservatively with intravenous fluids, electrolytes, analgesics, antibiotics, nasogastric decompression, sedation, and blood transfusion when indicated. Major complications, including biliary fistula, biliary peritonitis, or bile duct strictures, were managed surgically using Roux-en-Y

hepaticojejunostomy, Roux-en-Y choledochoje-junostomy, liver resection with right and left duct anastomosis, or controlled biliary fistula as appropriate. Retained stones were treated with endoscopic papillotomy and extraction. Patient outcomes were assessed during routine follow-up.

RESULTS

Table 1 shows the age and sex distribution of the study participants. The highest number of patients were in the 31-40-year age group with 20 patients (40%), followed by 17 patients (34%) in the 41-50-year age group. Seven patients (14%) were aged 21-30 years, while 5 patients (10%) were aged 51-60 years. Only one patient (2%) was below 20 years of age. Male patients constituted the majority of the study population with 43 patients (86%), whereas females accounted for 7 patients (14%), giving a male-to-female ratio of approximately 6.1:1. Table 2 summarizes the mode of presentation of patients following biliary tract surgery. Bile duct injury was identified in 15 patients (30%), presenting as biliary fistula in 5 patients (10%), biliary stricture in 4 patients (8%), and per-operative injury as well as biliary peritonitis in 3 patients (6%) each. Minor bile leak was observed in 10 patients (20%). Post-cholecystectomy syndrome occurred in 6 patients (12%), while residual stones and haemorrhage were each noted in 5 patients (10%). Biloma, wound infection, and chest infection were documented in 3 patients (6%) each.

Table 3 outlines the clinical features observed at presentation. Jaundice was the most common clinical feature, present in 20 patients (40%). Fever and pruritus were each observed in 18 patients (36%), while abdominal pain was reported by 15 patients (30%). Figure 1 illustrates the causes of biliary injury in the study population. The majority of injuries occurred following laparoscopic cholecystectomy, accounting for 12 cases (80%), while 3 cases (20%) resulted from open cholecystectomy.

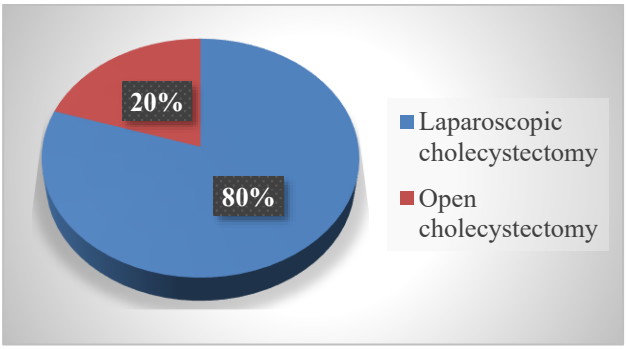

Figure 1: Causes of biliary injury (n=15).

Figure 2 shows the time interval between surgery and presentation. Most patients, 35 (70%), presented within the first month, including per-operative and early post-operative cases. Eleven patients (22%) presented between the 2nd and 6th months, and 4 patients (8%) presented between the 7th and 12th months. Table 4 summarizes the investigations performed in the study population. Ultrasound of the whole abdomen and liver function tests were each performed in 36 patients (72%). ERCP was performed in 10 patients (20%), while MRCP was conducted in 2 patients (4%) to evaluate the biliary anatomy and site of injury. Figure 3 shows the distribution of biliary injuries according to the Bismuth classification. The majority of injuries were grade 3, occurring in 8 patients (53.3%), followed by grade 2 in 4 patients (26.7%). Grade 1 and grade 4 injuries were less common, seen in 2 patients (13.3%) and 1 patient (6.7%), respectively.

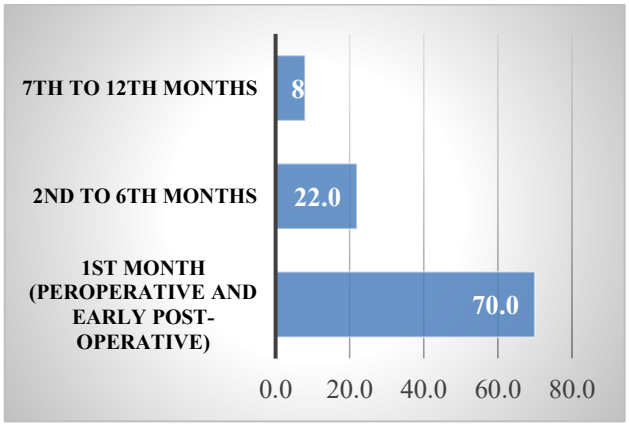

Figure 2: Time of presentation after biliary tract surgery (n=50).

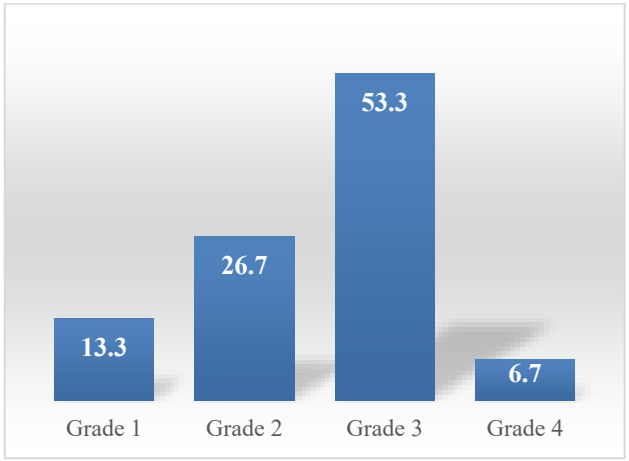

Figure 3: Grade of biliary injury according to bismuth classification (n=15).

Table 5 summarizes the management of complications following biliary tract surgery. Operative procedures were performed in 20 patients (40%), non-operative management in 17 patients (34%), endoscopic interventions in 5 patients (10%), and per-operative peritoneal toileting in 8 patients (16%). Among the operative cases, Roux-en-Y hepaticojejunostomy was the most common procedure (12 patients, 60%), followed by controlled biliary fistula (8 patients, 40%), Roux-en-Y choledochojejunostomy (2 patients, 10%), liver resection

with right and left duct anastomosis with Roux-en-Y loop (1 patient, 5%), and secondary wound closure (5 patients, 25%). Figure 5 shows the follow-up outcomes of patients after biliary tract surgery. Out of 50 patients, 30 (60%) attended follow-up. Recurrent cholangitis was observed in 7 patients (14%), subphrenic abscess in 1 patient (2%), and restricture in 2 patients (4%). Twenty patients (40%) had no complaints during the follow-up period.

Table 1: Demographic profile of the study participants (n=50).

Variables		Number of patients (N)	Percentage (%)
Age (years)	<20	1	2.0
	21-30	7	14.0
	31-40	20	40.0
	41-50	17	34.0
	51-60	5	10.0
Sex	Male	43	86.0
	Female	7	14.0

Table 2: Mode of presentation of patients following biliary tract surgery (n=50).

Mode of presentation	Number of patients (N)	Percentage (%)
Bile duct injury (n=15)		
Per-operative	3	6.0
Biliary fistula	5	10.0
Biliary peritonitis	3	6.0
Biliary stricture	4	8.0
Minor bile leak	10	20.0
Post-cholecystectomy syndrome	6	12.0
Residual stones	5	10.0
Haemorrhage	5	10.0
Biloma	3	6.0
Wound infection	3	6.0
Chest infection	3	6.0

Table 3: Clinical features at presentation (n=50).

Clinical features	Number of patients (N)	Percentage (%)
Jaundice	20	40.0
Fever	18	36.0
Pruritis	18	36.0
Abdominal pain	15	30.0

Table 4: Investigations performed in study participants (n=50).

Investigations	Number of patients (N)	Percentage (%)
USG of whole abdomen	36	72.0
Liver function test (LFT)	36	72.0
ERCP	10	20.0
MRCP	2	4.0

Table 5: Management strategies and operative procedures in study patients.

Variables		Number of patients (N)	Percentage (%)
Treatment modality	Operative procedures	20	40.0
	Non-operative	17	34.0
	Endoscopic	5	10.0
	Per-operative peritoneal toileting	8	16.0
Operative procedure	Roux-en-Y hepaticojejunostomy	12	60.0
	Controlled biliary fistula	8	40.0
	Roux-en-Y choledochojejunostomy	2	10.0
	Liver resection with right and left duct anastomosis with Roux-en-Y loop	1	5.0
	Secondary wound closure	5	25.0

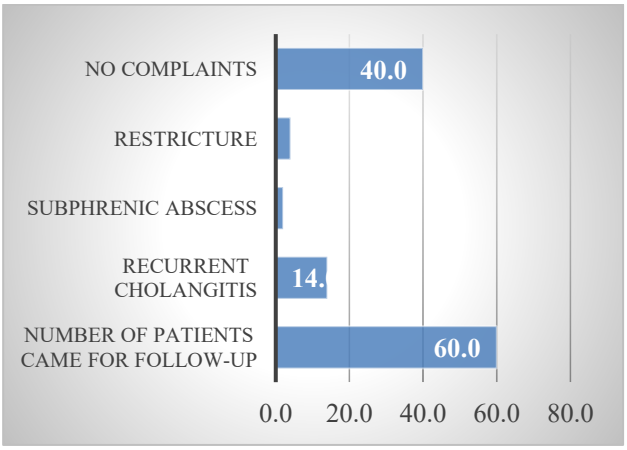

Figure 4: Follow-up outcomes of study patients (n=50).

DISCUSSION

Complications following biliary tract surgery can have serious consequences. The exact incidence of such complications among Bangladeshi patients is not well documented. Injury has been reported in approximately 0.2% of patients undergoing open cholecystectomy.[15] In a meta-analysis from the USA (1996-2001), the rate of bile duct injury in laparoscopic procedures was higher than that in open surgery, ranging from 0.4% to 0.8%, which appears to be related to the experience of the operating surgeons.[15] In the present prospective study, different surgical units of DMCH and BSMMU were selected, as these tertiary centers manage referral cases from across the country.

In the present study, the majority of patients were concentrated in the third and fourth decades of life, with 40% aged 31-40 years and 34% aged 41-50 years, indicating that biliary tract complications predominantly affect individuals in their most active adult years. This age distribution is comparable to the findings of Vincenzi et al who reported a median patient age within the middle-age group (approximately 47-52 years) among patients with bile duct injuries, supporting the observation that biliary injuries and their sequelae are more common in middle-aged populations.[16]

Furthermore, our study demonstrated a marked male predominance, with males accounting for 86% of cases and a male-to-female ratio of 6.1:1. This finding aligns with the population-based analysis by Waage et al which identified male sex as a significant risk factor for bile duct injury in a large cohort of patients undergoing cholecystectomy.[15] The predominance of middle-aged male patients in the present series may reflect higher operative complexity, delayed presentation, or referral bias in tertiary care centers, and is consistent with demographic trends reported in large epidemiological and systematic studies of biliary tract injury. Bile-related complications were the most common mode of presentation in the current study of 50 patients undergoing biliary tract surgery, with minor bile leaks accounting for 20% of cases.

Bile duct injury-related presentations, such as biliary fistula, biliary peritonitis, and biliary stricture, accounted for 30% of patients. This pattern is consistent with previously published literature. Koirala et al similarly reported bile leak as the most frequent biliary complication following laparoscopic cholecystectomy, with associated biloma formation and bile duct injuries requiring further management.[17] In our series, biloma (6%) and biliary fistula (10%) were notable presentations, reflecting persistent bile leakage and ductal disruption, comparable to observations in larger cohorts. Non-biliary causes such as post-cholecystectomy syndrome (12%) and residual stones (10%) were also observed, highlighting ongoing functional or obstructive pathology after surgery. Additionally, complications like haemorrhage, wound infection, and chest infection, though less frequent, contributed to postoperative morbidity. Overall, the findings of this study reaffirm that bile leak and bile duct injury remain the predominant complications following biliary tract surgery, in agreement with established reports.

In the present study, jaundice was the most frequent clinical feature at presentation, observed in 40% of patients, followed by fever and pruritus in 36% each, and abdominal pain in 30%. This pattern reflects the typical symptom complex of biliary obstruction, bile leakage, or ongoing inflammatory processes following biliary tract surgery.

Similar findings have been reported by El-Shafei et al who, in a comprehensive clinical review, demonstrated that jaundice, abdominal pain, and fever constitute the most common presenting features in patients with bile duct injury, often occurring in association with bile leaks and other manifestations of biliary obstruction.[18] The presence of pruritus in over one-third of patients in the current study further supports the role of cholestasis in postoperative biliary complications. Overall, the clinical profile observed in this study closely aligns with previously published data, reinforcing that jaundice-predominant presentations with accompanying systemic and abdominal symptoms are characteristic of biliary tract injuries and their sequelae following surgery.

In this study, most bile duct injuries were associated with laparoscopic cholecystectomy, representing 12 out of 15 cases (80%), whereas injuries following open cholecystectomy were less common, accounting for only 3 cases (20%). This finding is consistent with the report by Nuzzo et al in their large multicenter Italian study of 56,591 laparoscopic cholecystectomies, which demonstrated that bile duct injuries are more frequently associated with laparoscopic procedures compared to open surgery.[19]

The higher proportion of injuries in laparoscopic cases may be attributed to factors such as limited visualization, misidentification of biliary anatomy, and technical challenges inherent to the laparoscopic approach. These results reinforce the widely recognized trend that, although both surgical approaches carry a risk of bile duct injury, laparoscopic cholecystectomy represents the predominant context for such complications in modern biliary surgery practice.

In the present study, most patients (35 of 50; 70%) presented within the first month following biliary tract surgery, including per-operative and early post-operative cases, while 11 patients (22%) presented between the 2nd and 6th months, and 4 patients (8%) presented between the 7th and 12th months. These findings are comparable to those reported by Abdel et al who observed that 89% of post-laparoscopic cholecystectomy bile duct injuries were diagnosed within the first month, with early presentations typically resulting from major bile leaks causing peritonitis and delayed presentations associated with fistulas and strictures.[20] The predominance of early presentations in both studies underscores the acute nature of most postoperative biliary complications, highlighting the importance of vigilant monitoring during the immediate post-operative period, while the smaller proportion of delayed presentations emphasizes the need for ongoing follow-up to identify complications such as strictures or persistent biliary fistulae.

In the present study, abdominal ultrasonography and liver function tests were the most commonly performed investigations, each conducted in 36 patients (72%), serving as primary tools to assess biliary tract anatomy and function. ERCP was performed selectively in 10 patients (20%) to further delineate the site and extent of injury or obstruction, while MRCP was utilized in 2 patients (4%) to provide non-invasive detailed visualization of the biliary tree. These findings are consistent with the observations of Hadi et al., who reported routine use of ultrasonography and MRCP in all patients with iatrogenic bile duct injuries, with ERCP reserved for specific diagnostic or therapeutic purposes.[21] This similarity underscores the standard practice of employing non-invasive imaging as the initial evaluation, with targeted use of ERCP for management decisions in patients presenting with postoperative biliary complications.

In the present study, the majority of bile duct injuries were classified as Bismuth grade 3, occurring in 8 patients (53.3%), followed by grade 2 in 4 patients (26.7%), with fewer cases of grade 1 (13.3%) and grade 4 (6.7%).

This distribution indicates that mid-level injuries affecting the hepatic duct confluence are the most frequently encountered in clinical practice, consistent with the findings of Díaz-Martínez et al who reported Bismuth type III as the most common injury (35.4%), followed by type II (29.1%) and type IV (17.7%) in their series of 79 patients requiring surgical management.[22] The similarity between these studies highlights that Bismuth grade 2 and 3 injuries represent the bulk of clinically significant biliary injuries, emphasizing the importance of accurate classification for guiding surgical repair and predicting outcomes. In the present study, management of complications following biliary tract surgery involved a combination of operative, non-operative, endoscopic, and per-operative interventions.

Operative procedures were performed in 20 patients (40%), with Roux-en-Y hepaticojejunostomy being the most commonly employed procedure in 12 patients (60% of operative cases), followed by controlled biliary fistula management in 8 patients (40%), Roux-en-Y choledochojejunostomy in 2 patients (10%), liver resection with right and left duct anastomosis in 1 patient (5%), and secondary wound closure in 5 patients (25%). Non-operative management was utilized in 17 patients (34%), endoscopic interventions in 5 patients (10%), and per-operative peritoneal toileting in 8 patients (16%).

These findings are consistent with the study by Mohammed et al which reported that the majority of patients with post-cholecystectomy bile duct injuries underwent Roux-en-Y hepaticojejunostomy (86%), with a minority receiving other biliary repairs, reinforcing that Roux-en-Y hepaticojejunostomy remains the predominant operative procedure in contemporary clinical practice.[23] The distribution of non-operative and endoscopic interventions in the present study also mirrors modern trends in selective, tailored management based on the severity and type of injury.

In the present study, follow-up outcomes of patients after biliary tract surgery demonstrated that 30 patients (60%) attended follow-up, of whom 7 (14%) experienced recurrent cholangitis, 2 (4%) developed restricture, and 1 (2%) had a subphrenic abscess, while 20 patients (40%) reported no complaints. These findings are consistent with those reported by AbdelRafee et al who observed recurrent cholangitis in 14.2% and anastomotic strictures in 11.6% of patients following Roux-en-Y hepaticojejunostomy for post-cholecystectomy bile duct injury, and with Halle-Smith et al who noted that long-term complications such as recurrent cholangitis and stricture formation are common and require extended monitoring.[24,25] The concordance between these studies and the present cohort underscores that late complications, particularly recurrent cholangitis and restricture, remain important considerations in post-operative surveillance, highlighting the necessity of structured follow-up to detect and manage these sequelae effectively.

Limitations

The sample size was relatively small, reducing the ability to detect less common complications or perform detailed subgroup analyses. Late presentation of patients and variable access to advanced diagnostic tools may have

influenced the outcomes and underrepresented the true spectrum of postoperative complications.

CONCLUSION

This study was carried out at Dhaka Medical College Hospital and Bangabandhu Sheikh Mujib Medical University. Biliary tract injury has long been recognized, but it has become a greater concern with the widespread adoption of laparoscopic cholecystectomy. Factors such as older age, female sex, disease severity, hospital characteristics, and the surgeon's experience influence the risk of bile duct injury. Proper patient selection, a high degree of suspicion, careful dissection, correct interpretation of anatomy, avoidance of diathermy, and conversion to an open approach when in doubt can help prevent complications. Perioperative and early postoperative recognition of bile duct injury, followed by repair by an experienced surgeon, can improve outcomes. However, in our study, the outcome of repair was suboptimal due to late presentation. Surgery remains the mainstay of treatment, with Roux-en-Y hepaticojejunostomy being the procedure of choice, while endoscopic or radiological interventions have a selective role. Patients require long-term follow-up. Surgeons should be aware that the consequences of biliary injury can include complex operative repair, major morbidity, prolonged hospitalization, high cost, litigation, numerous perioperative diagnostic and therapeutic procedures, and frequent readmissions. All efforts should be made to prevent such complications and to manage them effectively if they occur.

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