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IATROGENIC BILE DUCT INJURY FOLLOWING OPEN AND LAPAROSCOPIC CHOLECYSTECTOMY: EXPLORING PATTERNS, MANAGEMENT, AND TREATMENT OUTCOMES

Rehana Raza[1]*, Manal Muzammil[2], Abdul Rehman[3], Lekhraj Mal[4], Imtiaz Ali Langah[5], Rafia Unar[6]

[1]*Specialist General Surgery, Zubeda khaliq Memorial Free Hospital Skardu Pakistan.
email: rehana.r88@gmail.com
[2]Registrar General Surgery, Akbar Niazi Teaching Hospital Islamabad Pakistan.
email: manalmuzammil@gmail.com
[3]Assistant Professor of Anatomy, Bhitai Dental and Medical College Mirpurkhas Pakistan.
email: drabdulrehman2008@gmail.com
[4]Assistant Professor of General Surgery, Bhitai Dental and Medical College Mirpurkhas Pakistan.
email: lekhrajdr@icloud.com
[5]Assistant Professor of General Surgery, Peoples University of medical and Health sciences for women Nawabshah Pakistan. email: langahimtiaznova@gmail.com
[6]Women Medical Officer General Surgery, Liaquat University Hospital Hyderabad Pakistan.
email: rafiaunar@yahoo.com

***Corresponding Author: -** Rehana Raza
*Specialist General Surgery, Zubeda khaliq Memorial Free Hospital Skardu Pakistan.
email: rehana.r88@gmail.com

Abstract

Objective: The objective of this study is to determine the incidence rate of iatrogenic bile duct injuries occurring after open and laparoscopic cholecystectomy procedures as well as to evaluate the outcomes in the postoperative phase.

Study design: A cross-sectional study

Place and Duration This study was conducted in Zubeida Khaliq Memorial free trust Hospital Skardu from March 2022 to March 2023

Methodology: A total of 60 patients with iatrogenic bile duct injuries were admitted through the OPD and emergency department. Baseline investigations were conducted, including Magnetic resonance cholangiopancreatography (MRCP) and endoscopic retrograde cholangiopancreatography (ERCP) in specific cases. Postoperatively, patients were monitored in the surgical ward and discharged after drain removal. A six-month OPD follow-up was conducted, with data analyzed using SPSS version 26.

Results: Within the cohort of 60 patients, subgroup analysis reveals that 24 cases (40%) encountered injuries within our unit, while the remaining 36 cases (60%) were referred from other hospitals. The mean age of the patients was 45±5 years, with a significant male-to-female ratio of 1:4. The primary presenting complaints encompassed jaundice, abdominal pain, and persistent bile discharge. Surgical interventions performed encompassed Roux-en-Y choledochojejunostomy (n=39 - 65%), choledochoduodenostomy (n=15 - 25%), and primary repair with a T-tube (n=6 - 10%). Analysis of postoperative occurrences indicated bile leaks (n=6 - 10%), wound infections

(n=9 - 15%), and recurrent cholangitis (n=3 - 5%). The usual duration of hospitalization ranged from 11 to 16 days.

Conclusion: In conclusion, this study highlights iatrogenic bile duct injuries post-cholecystectomy, stressing improved surgical awareness and timely intervention. Surgical strategies, including Roux-en-Y choledochojejunostomy and choledochoduodenostomy, offer efficacy despite complications. Enhanced patient care and monitoring protocols are crucial for better outcomes.

Keywords: bile duct injury, cholecystectomy, laparoscopic, surgical complications, management, Roux-en-Y choledochojejunostomy, choledochoduodenostomy, postoperative outcomes, patient care, monitoring protocols

Introduction

Gallstone formation is unequivocally the most prevalent pathological condition afflicting the gallbladder, affecting a substantial portion of the adult population worldwide with an estimated prevalence of 10–15%. Interestingly, this condition exhibits a discernible gender bias, with a notably higher incidence in females [1]. The optimal therapeutic approach for symptomatic gallstone disease is cholecystectomy, although this intervention has been associated with a discernibly increased likelihood of bile duct injuries [2].

The escalating incidence of iatrogenic bile duct injuries (IBDIs) parallels the frequency of interventions involving the bile ducts. In order to treat these kinds of complicated injuries, doctors have used procedures like end-to-end anastomosis and Roux-en-Y biliary enteric anastomosis to make sense of the complicated anatomy [3]. Existing epidemiological data paints a distinct picture concerning IBDIs. Post-open cholecystectomy, the reported incidence hovers within the range of 0.1-0.3%, whereas the prevalence post-laparoscopic cholecystectomies are estimated at around 2%. This surge in incidence has, in part, been attributed to the early phases of adopting laparoscopic techniques, where the learning curve of surgeons intersected with challenges in interpreting the endoscopic visual field [4]. However, this unsettling trajectory took a reassuring course, with the incidence plummeting to less than 0.5% over time. The appreciable reduction in IBDIs is a testament to the amalgamation of the maturing experience of surgical practitioners and the advancement of sophisticated instrumentation [5].

Several factors converge to precipitate iatrogenic bile duct injuries. These factors include the use of adhesive bands near the surgical site, not taking into account the possibility of abnormal bile duct structures, using diathermy too close to the sensitive bile ducts, doing too much surgery near the difficult Calot's triangle, and unplanned blood loss [6]. Iatrogenic bile duct injuries can range from complete to partial transection of the bile ducts, which can cause bile leaks, to the unintentional tying off of major bile ducts in the most severe cases. The result of these kinds of things can be the formation of strictures, which shows how serious bile duct injuries caused by surgery are [7, 8]. Persistent drainage of bile-stained fluid from the drain, coupled with elevated serum bilirubin and alkaline phosphatase levels, the manifestation of local or generalized peritonitis, and indications of septicemia, collectively serve as clinical markers that suggest the plausible occurrence of iatrogenic bile duct injury [8]. Complementary diagnostic investigations for precise diagnosis and the formulation of a definitive treatment plan encompass a spectrum of modalities, including abdominal ultrasonography, computed tomography (CT) of the abdomen, magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP), and intraoperative cholangiography (IOC) [9].

The main goal of this study was to carefully look at how often bile duct injuries caused by doctors happened after both open and laparoscopic cholecystectomy procedures. An examination of the subsequent postoperative outcomes complements this assessment and together they help to provide a thorough understanding of the effects of such injuries in the context of these surgical interventions.

Methodology

The study cohort consisted of a total of 60 patients. Among these, 24 patients (40%) encountered iatrogenic bile duct injuries within our medical unit, while the remaining 36 patients (60%) were referred from other medical facilities. Remarkably, the referred cases encompassed 30 instances (83.3%) of open cholecystectomy and 6 cases (16.6%) of laparoscopic cholecystectomy.

Within the subset of cases managed within our unit, 6 cases were identified intraoperatively during open cholecystectomy, and an additional 12 cases were diagnosed within a period of 7 to 14 days post-surgery. Similarly, among the six cases involving laparoscopic cholecystectomy, the diagnosis was confirmed within the first week after the procedure. Furthermore, all 36 of the referred patients promptly sought consultation at the surgical department of our institution, typically within the first month following their respective surgical interventions. Thorough medical history collection and comprehensive physical examinations were conducted as part of the initial assessment. Clinical indicators encompassed symptoms such as vomiting, fever, jaundice, and continuous bilious discharge noted from the drain situated in the right hypochondrium. All patients underwent a battery of essential investigations, including liver function tests, complete blood count, blood urea/creatinine levels, random blood sugar evaluation, serum electrolyte assessment, prothrombin time (PT), and activated partial thromboplastin time (APTT) measurements.

To ascertain the presence and specifics of iatrogenic bile duct injuries, tailored diagnostic measures were employed. These included abdominal ultrasonography (USG) for 56 cases, magnetic resonance cholangiopancreatography (MRCP) for 51 cases, and endoscopic retrograde cholangiopancreatography (ERCP) for 28 cases. These investigations not only aimed at confirming the diagnosis but also facilitated injury classification and guided the formulation of an appropriate treatment strategy. The patients were initiated on intravenous injections of ceftriaxone at a dose of 1 gram administered twice daily. Concurrently, intravenous fluids were administered at a rate of 3 litres per day, and omeprazole was infused intravenously at a dosage of 40 mg once daily. An intravenous injection of tramadol was provided as needed for pain management.

Prior to commencing any procedures, the patients were adequately informed, and their informed consent was procured. The nature of the surgical procedure was meticulously explained to both the patients and their respective family members. The surgeries were executed via subcostal incisions while the patients were under general anesthesia. Following the surgical interventions, patients were vigilantly monitored within the confines of the surgical ward. The removal of the drainage apparatus was undertaken before patients were discharged from the hospital. For patients equipped with T-tubes, a recommendation was provided for a T-tube cholangiogram to be conducted on the 10th day post-surgery.

Patients were also advised to adhere to the follow-up schedule, with appointments scheduled for the 10th day post-surgery and one month thereafter at the outpatient department (OPD). During the initial follow-up visit, a wound assessment was conducted, postoperative complications were documented, and any necessary stitches were removed. The removal of T-tubes occurred upon the observation of unobstructed dye flow into the duodenum during T-tube cholangiograms. Supplementary abdominal ultrasonography (USG) was performed whenever there was any suspicion of intra-abdominal collections.

Data garnered from these processes was meticulously recorded on specific forms and subjected to analysis utilizing the Statistical Package for the Social Sciences (SPSS) version 26. This analytical endeavor contributed to the comprehensive understanding of the therapeutic process and its associated outcomes.

Results

The study cohort encompassed a group of 60 patients, all of whom had experienced iatrogenic bile duct injuries arising from both open and laparoscopic cholecystectomy procedures. Among this patient assembly, there were 12 male participants (20%) and 48 female individuals (80%), thereby

establishing a discernible male-to-female ratio of 1:4. The calculated mean age of this patient ensemble stood at 45±5 years.

From the subset of patients who encountered injuries within our unit, a noteworthy pattern emerged. Specifically, six instances (25%) were expeditiously identified during the actual surgical procedure, compelling immediate intraoperative management under the same anesthesia. In tandem, 18 other cases (75%) were retrospectively diagnosed during the postoperative period, typically unfolding within a window of 7 to 14 days subsequent to the initial surgery.

When dissecting the cases subject to open cholecystectomy, a classification according to the Bismuth criteria revealed distinctive injury types. In specific terms, 36 patients (75%) exhibited type 1 injuries, while 6 patients (12.5%) demonstrated type 2 injuries, and a parallel 6 patients (12.5%) showcased type 3 injuries. Contrarily, in the realm of laparoscopic cholecystectomy, all 12 patients (100%) had the same presentation of type 3 injuries.

Table 1. Patients distribution as per the site of the bile duct injury

Procedure	Site		Cases	Percentage
	CHD	CBD		
Open Cholecystectomy	12	0	12	20
Laparoscopic Cholecystectomy	6	42	48	80
Total	18	42	60	100

The gamut of operative interventions executed is elaborated within Table II

Table 2. Procedure Performed

Procedure	Cases	Percentage
Choledochoduodenostomy	15	25
Roux- en Y Choledochojejunostomy	39	65
End-end Anastomosis over T-tube	6	10

It is noteworthy that a subset of the patient cohort, comprising 24 cases (40%), experienced postoperative complications. Six of these cases (10%) had leakage after surgery, nine (15%) had wound infections, and three (5%) had cholangitis come back. It is reassuring to report that the study recorded no instances of mortality. The duration of hospitalization for the patients was variable, spanning a range between 11 and 16 days.

Furthermore, the monitoring continuum extended beyond the hospitalization phase, as the patients were meticulously followed up through a series of outpatient department (OPD) visits spanning a span of 6 months subsequent to their respective surgical interventions. This comprehensive postoperative monitoring period served as a testament to the meticulous approach adopted in this study.

Discussion

Iatrogenic bile duct injury is a serious problem that can happen during biliary surgery. Not only does it make things hard for the primary surgeon, but it also makes things hard for even the most experienced referral centres that take care of the patient after surgery [10]. This condition is closely linked with extended periods of morbidity and heightened rates of early mortality [11]. Inadequate handling of iatrogenic bile duct injury has the potential to give rise to severe complications, including peritonitis, sepsis, multi-organ failure, and the development of cirrhosis [12].

Shaikh et al. documented an occurrence rate of 0.13% to 0.55% for iatrogenic bile duct injuries (IBDIs) in a localized investigation [13]. In our study, the observed incidence of iatrogenic bile duct injuries (IBDIs) stood at 0.9% within the open cholecystectomy group, while it amounted to 1.3% following the utilization of laparoscopic cholecystectomy. It is imperative to note that iatrogenic bile duct injuries often elude immediate intraoperative detection, and patients might subsequently

manifest symptoms such as progressive jaundice resulting from biliary leakage or the eventual formation of strictures.

Within the context of this study, a noteworthy 18 patients (90%) presented with jaundice, while 8 patients (40%) exhibited symptoms indicative of peritonitis. These peritonitis manifestations stemmed from the presence of localised or generalised collections. This profile aligns closely with outcomes from a comparable study, thereby underscoring the consistency and reliability of our findings [14]. The first step in diagnosing iatrogenic bile duct injuries (IBDIs) is to do an abdominal ultrasonography (USG), which is a test that can find localised or generalised collections [15].

The occurrence of iatrogenic bile duct injuries can be averted through the implementation of meticulous surgical techniques. In cases where suspicion arises during the surgical procedure itself, immediate repair within the same operative session is considered optimal. Most bile duct injuries caused by doctors are best treated with surgery. Roux-en-Y hepaticojejunostomy is the gold standard for treating this complicated condition [16].

In our study, all enrolled patients underwent surgical reconstruction as part of the treatment regimen. The incidence of wound infection was documented at 15%, a figure that falls within an acceptable range when compared to findings from parallel investigations. A thorough follow-up period spanning 6 months was administered to monitor patient progress, revealing the absence of stricture formation.

Conclusion

Roux-en-Y choledochojejunostomy emerges as the optimal surgical solution for bile duct injuries, exhibiting a marked reduction in postoperative complications and significantly enhancing patient outcomes. This technique adeptly navigates the complexities of bile duct injuries while fostering an environment of minimal postoperative complications, setting a commendable benchmark in surgical intervention.

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Interest confliction

There was no conflict of interest in the present study.

Permission

Permission was acquired and received from the ethical committee before the conduct of the study.

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