

Causes and Results of Repeated Operations in Iatrogenic Lesions of the Biliary System

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Abstract

Introduction: Iatrogenic injuries, resulting from medical interventions, often necessitate repeat surgeries, which pose significant challenges for patients and health-care systems. This retrospective study aimed to evaluate the occurrence and outcomes of various procedures for iatrogenic injuries, focusing on liver and bile duct traumas. **Methods:** The study included 110 patients aged 34–72 years who underwent reoperation due to surgical complications at two leading medical centers in Bishkek, Kyrgyzstan, from 2015 to 2023. Of these, 21 (19.3%) patients required additional surgery, primarily due to iatrogenic harm to the liver and bile ducts during initial operations, predominantly laparoscopic cholecystectomies for cholelithiasis. The diagnostic approach incorporated clinical assessment, imaging studies, and laboratory analysis. **Results:** Reoperations varied according to injury type and severity, with immediate operations conducted on 17 (81%) patients and delayed reconstructive surgeries performed on 4 (19%) patients. Post-reoperation complications occurred in 5 (23.8%) patients, and the average hospital stay was 14 days. The study reported a 4.8% mortality rate, highlighting the significant risks associated with surgical management of iatrogenic injuries. **Conclusion:** Effective management of these injuries requires a comprehensive approach that prioritizes patient safety, quality of care, and efficient resource utilization. Ongoing professional development, adherence to guidelines, and continued research on prevention and innovative surgical techniques are essential to reduce the occurrence of iatrogenic injuries and improve patient outcomes.

Key words: Bile duct injuries, hepaticojejunostomy, iatrogenic injuries, laparoscopic cholecystectomy, liver injuries, repeated surgery

INTRODUCTION

Repeat surgeries for iatrogenic injuries are a major health-care concern, arising from medical interventions and affecting patient outcomes and the health-care system. These injuries occur during various procedures including surgeries and diagnostic tests, necessitating additional surgical interventions to address the damage.

Iatrogenic injuries result from medical care or diagnostic procedures caused by surgical errors, medical-device complications, or adverse medication reactions. They can extend hospital stays, increase health-care costs, and increase patient morbidity and mortality rates. The

complexity of initial procedures influences the likelihood of iatrogenic injuries, with intricate surgeries involving delicate anatomical structures posing higher risks.^[1,2]

Health-care provider misjudgment, inexperience, inadequate protocols, or outdated equipment often contribute to these

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injuries.^[3,4] Technologies such as robot-assisted surgeries may reduce injuries through enhanced precision but can introduce new risks if not properly implemented.^[5,6] Repeat surgeries aim to rectify initial damage and minimize further harm but carry higher risks due to altered anatomy with scar tissue and potential recurrent injuries.^[7,8]

Enhancing surgical training and safety protocols can reduce the incidence of iatrogenic injuries. Ongoing education for health-care professionals minimizes human errors and enhances patient safety.^[1,3] Advanced technologies, such as robotic systems and endovascular techniques, improve surgical precision and outcomes and reduce the need for repeat operations. Robotic techniques for biliary reconstruction, for example, have shown reduced operative time and blood loss compared to traditional methods.^[5] A multidisciplinary approach involving various specialists ensures comprehensive care and effective complication management, crucial for planning, and executing repeat operations to optimize outcomes.^[6,7] This study aimed to evaluate the occurrence and outcomes of various procedures for iatrogenic injuries, with a focus on liver and bile duct traumas.

MATERIALS AND METHODS

Study design

This retrospective analysis was conducted from 2015 to 2023 at two leading medical centers in Bishkek, Kyrgyzstan. The study protocol was approved by the institutional ethics board, which ensured adherence to ethical guidelines and patient privacy.

Patient population

This study included 110 patients aged 34–72 years who underwent reoperation because of surgical complications. Of these, 21 (19.3%) patients (11 [52%] women and 10 [48%] men) required additional surgery, primarily because of iatrogenic harm to the liver and bile ducts. These injuries occurred during the initial operations, predominantly laparoscopic cholecystectomies for cholelithiasis, with subsequent repercussions.

Diagnostic approach

All the patients were diagnosed with cholelithiasis and exhibited either acute or chronic calculous cholecystitis. The diagnostic approach was comprehensive, incorporating both clinical assessment and imaging studies to determine the nature and extent of the injuries. Thorough medical history and physical examination were conducted for all patients. Indicators such as persistent abdominal pain, jaundice, fever, and bile leakage suggest potential iatrogenic injuries.

Imaging studies

Ultrasonography was initially performed in all patients to detect possible bile duct damage, bile accumulation, or fluid in the abdominal cavity. Magnetic resonance imaging was performed in complex cases in which bile duct injury was suspected. Magnetic resonance cholangiopancreatography provides detailed imaging of the bile duct structure and identifies transections, leaks, or strictures.

Laboratory analysis

Elevated C-reactive protein levels were used to assess the inflammatory response and potential infections. Procalcitonin was used to detect systemic infections, especially in suspected biliary peritonitis cases.

Surgical techniques and management

Reoperations varied according to the injury type and severity. Emergency surgery was performed in critical cases of peritonitis, active bleeding, or bile leakage. Bleeding injuries are managed through surgical hemostasis using sutures or electrocautery to stop bleeding in the hepatic or ductal tissues. Temporary bile diversion for bile leakage was achieved through T-tube insertion or external drainage. Staged approach for stable patients, allowing initial stabilization before definitive reconstructive surgery. Roux-en-Y hepaticojejunostomy was performed to restore the bile flow in patients with complete bile duct transection or hepatic injury.

Data collection and analysis

Patient data, including demographics, surgical specifics, injury details, reoperation timing, and postoperative outcomes, were obtained from medical records. The results were statistically analyzed, emphasizing the complication rates, duration of hospital stay, and mortality rates. Descriptive statistics were used to summarize the data, presented as means, medians, and percentages.

RESULTS

The study included 110 patients, of whom 21 (19.3%) patients required additional surgery because of accidental liver and bile duct injuries. These complications typically arise during laparoscopic removal of the gallbladder.

The injuries were classified as follows: 4 (19%) cases of common bile duct wall damage, 2 (9.5%) cases of full bile duct severance, 2 (9.5%) cases of liver injury or trauma, 6 (28.6%) cases of cystic duct tie loosening, 4 (19%) cases of right hepatic duct damage, and 3 (14.3%) cases of left lobar duct damage [Table 1].

Table 1: Data of demographics and initial surgery in patients

S. No.	Type of injury	n (%)
1	Parietal damage to the common bile	4 (19)
2	Complete bile duct transection	2 (9.5)
3	Liver laceration or trauma	2 (9.5)
4	Ligature slippage from the cystic duct	6 (28.6)
5	Right hepatic duct damage	4 (19)
6	Left lobar duct damage	3 (4.3)

Values are presented as the n =Number of the patients and % = Percentage

Most injuries were detected during surgery or within 24 h postoperatively, with some cases identified up to a week later.

Surgical procedures and timing

Reoperations were grouped based on urgency and intervention type.

Immediate operations were conducted on 17 (81%) patients, addressing peritonitis (13 patients), active bleeding (2 patients), and bile leakage (2 patients) [Table 2]. These procedures involved the following steps:

- Peritonitis treatment: Surgical cleaning, drainage, bile duct repair, or temporary diversion
- Bleeding control: Achieved through suturing, electrocautery, or clips, depending on the bleeding site and nature
- Bile diversion: T-tube insertion into the common bile duct for bile flow management and leak prevention in bile leakage cases
- Delayed reoperation: Four (19%) patients underwent initial stabilization. These involved reconstructive surgeries, such as hepaticojejunostomy or duct repair, to restore bile flow.

Post-reoperation complications

Five (23.8%) patients experienced complications following reoperations, including ongoing peritonitis in three patients, necessitating additional drainage and extended antibiotic treatment. Secondary hemorrhage in one patient was managed with blood transfusions and surgical re-exploration. Bile leakage occurred in one patient, requiring further drainage and supportive care. Multi-organ failure led to death in 1 (4.8%) patient, resulting from persistent infection and organ dysfunction despite surgical intervention and intensive care [Table 3].

Hospital duration and recovery

The average hospital stay for the reoperated patients was 14 days (range: 7–28 days). Recovery varied significantly

Table 2: Data of surgical interventions and timing in patients

S. No.	Type of intervention	n (%)
1	Immediate reoperations (peritonitis)	13 (61.9)
2	Immediate reoperations (active hemorrhage)	2 (9.5)
3	Immediate reoperations (bile leaks)	2 (9.5)
4	Delayed reoperations (reconstructive procedures)	4 (19)

Values are presented as the n =Number of the patients and % = Percentage

Table 3: Data of postoperative complications in patients

S. No.	Type of complication	n (%)
1	Persistent peritonitis	3 (14.3)
2	Secondary hemorrhage	1 (4.8)
3	Bile leaks	1 (4.8)
4	Multi-organ failure	1 (4.8)

Values are presented as the n =Number of the patients and % = Percentage

based on the injury type, reoperation urgency, and presence of complications. Patients undergoing immediate reoperations for peritonitis had longer hospital stays and slower recovery times, often requiring extended intensive care. Patients with less severe injuries or delayed reconstructive procedures experienced shorter hospital stays and better outcomes.

Mortality and overall results

The study reported a 4.8% mortality rate (1 out of 21 patients), highlighting the significant risks associated with the surgical management of iatrogenic injuries. Despite surgical intervention, the complication rate remained high (23.8%), reflecting the complexities and challenges of treating these injuries.

DISCUSSION

The discussion surrounding repeat procedures for iatrogenic injuries is multifaceted and requires a thorough understanding of clinical complexities, ethical considerations, and systemic implications. These interventions are necessary because of the unintended harm caused by medical treatment. Effective management is crucial to ensure patient safety and achieve the best possible outcomes.

The complexity of repeat procedures is significantly heightened by the formation of scar tissue, altered anatomical structures, and potential for recurring complications. These challenges require meticulous surgical planning and

management. Cutting-edge imaging techniques and precise instruments are vital for enhancing surgical precision. In cases of iatrogenic peripheral nerve injuries, incorrect diagnosis or delayed treatment can exacerbate the damage, leading to additional complications and the need for further surgical interventions.^[1]

Managing risks is crucial and requires thorough pre-operative assessments to weigh the potential benefits and risks of repeat procedures. This involves evaluating the extent of the initial injury, patient's overall health, and likelihood of positive outcomes. Approaches such as prompt intervention and the use of minimally invasive techniques can help mitigate these risks.^[7] Technological innovations, including robot-assisted surgeries and endoscopic procedures, have improved the accuracy and effectiveness of repeat operations, reducing surgical time and blood loss while enhancing recovery outcomes.^[5,6]

Interleukin-6 levels increase significantly in both acute and chronic cholecystitis, whereas treatment reduces cytokine concentrations and elevates interleukin-4 levels.^[9] Patients with acute cholecystitis exhibit enlarged gallbladder dimensions, thickened walls, and increased blood flow in the cystic artery, as detected by ultrasound imaging.^[10] Performing laparoscopic cholecystectomy in conjunction with gynecological procedures has proven to be a safe approach, offering patients reduced physical stress and quicker recuperation periods.^[11]

Clear communication is vital to ensure that patients understand the requirements, risks, and potential consequences of subsequent surgery. Informed consent, focusing on patient education and empowerment, fosters trust and involvement in decision-making.^[12] The impact on the patient's quality of life is also a critical consideration. Repeat procedures should aim not only to correct the initial injury but also to restore function and improve overall well-being. Psychological support is necessary to address the emotional toll of multiple surgical interventions.^[3]

Repeat procedures result in increased health-care costs, including extended hospital stay and greater resource utilization. Effective management of iatrogenic injuries through preventive measures can help alleviate these financial burdens.^[13] Ongoing professional development and adherence to established guidelines are essential to minimize the occurrence of iatrogenic injuries. Training programs incorporating simulations and real-world scenarios can enhance provider competence and reduce errors leading to repeat procedures.^[14,15]

Healthcare policies should promote practices to reduce iatrogenic injuries by encouraging the adoption of innovative technologies and fostering a culture of safety and accountability. Regular review and updating of clinical guidelines are necessary to align with current best practices.^[8]

Continued research on the causes and prevention of iatrogenic injuries is essential. Advancements in surgical techniques and technology have the potential to reduce the need for repeat procedures and improve patient outcomes.^[16] Multidisciplinary teams comprising surgeons, anesthesiologists, nurses, and rehabilitation specialists can provide comprehensive care for patients undergoing repeat surgeries, ensuring holistic treatment and facilitating better recovery.^[17,18]

CONCLUSION

Managing repeated iatrogenic injuries requires a comprehensive approach that prioritizes patient safety, quality of care, and efficient resource utilization. By addressing clinical, ethical, and systemic issues, health-care providers can improve outcomes and minimize the impact of iatrogenic injuries on patients and the health-care system.

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