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A Case Report and Literature Review: A Case of Delayed Bile Leakage Following Laparoscopic Cholecystectomy

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Abstract

Background: Delayed bile leakage after laparoscopic cholecystectomy, defined as occurring more than 72 hours after surgery, is a rare and serious complication of laparoscopic cholecystectomy, with an incidence rate of 0.060%. **Case Declaration:** This case report details a patient diagnosed with delayed bile leakage 43 days after laparoscopic cholecystectomy. The patient was discharged from our hospital after undergoing CT-guided puncture treatment, with no obvious complications identified. The patient was monitored for one year following the procedure, during which time no significant discomfort was reported. **Objective:** This case report is to analyse and review the clinical manifestations, diagnosis, treatment and prevention of delayed bile leakage after cholecystectomy, with reference to the relevant literature. **Results:** Delayed bile leakage after laparoscopic cholecystectomy can be prevented, although not eliminated. It is recommended that the operator treat the operation with caution, avoid taking risks, and adhere to careful procedures and strict separation according to the requirements. This approach is key to preventing late bile leakage in the postoperative period.

Keywords

Delayed Bile Leakage, Treatment, Laparoscopic Cholecystectomy

1. Introduction

Delayed bile leakage after laparoscopic cholecystectomy (LC) is defined as bile leakage occurring more than 72 hours after LC [1] [2]. This is one of the rare postoperative complications of LC and occurs in the absence of recent surgery, endoscopic intervention, or trauma. Some scholars posit that the definition

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should be extended to a period exceeding one week following surgery [3]. There are reports in the literature of bile leakage occurring as late as six [4] and nine years [5] following LC. However, the question of whether to diagnose delayed bile leakage remains somewhat controversial. There is a paucity of data regarding the incidence of this phenomenon. Lu [6] enumerated 12,963 patients who underwent LC in China and determined that there were 167 cases (0.060%) of patients with delayed bile leakage. Some scholars have determined the incidence to be 0.38% [7]. As the onset of delayed postoperative bile leakage occurs long after the time of surgery, misdiagnosis and omission of diagnosis are not uncommon in clinical practice. This paper presents a case of delayed bile leakage diagnosed 43 days after LC, accompanied by a literature review.

2. Case Declaration

The patient is a 41-year-old male who was admitted to Jingzhou Central Hospital on 5 September 2022, presenting with a 15-day history of intermittent abdominal discomfort. The patient presented with a chief complaint of abdominal pain, for which an investigation was proposed: 1) Acute appendicitis? 2) Kidney stones? 3) Acute intestinal obstruction? Previously, on 28 July 2022, the patient underwent LC for gallbladder stones with cholecystitis at Jingzhou Central Hospital. The remainder of the patient's medical history is devoid of any noteworthy abnormalities. A physical examination yielded no evidence of jaundice, a flat abdomen, and no palpable liver or spleen beneath the rib cage. The abdominal muscles exhibited no discernible tension, and pressure pain was present in the left abdomen and left lumbar region, but did not present with rebound pain. The bowel sounds were within normal limits, and there were no percussive sensations in either renal region. Following admission, the relevant auxiliary examinations were completed, and a blood routine was conducted: WBC: 12.46×10^9/L, NE: 11.34×10^9/L, L: 0.41×10^9/L. Liver function tests: DBiL: 14.1 umol/L, TBiL: 31.4 umol/L. An ultrasound examination of both kidneys and the bladder revealed the presence of fluid accumulation within the abdominal cavity. A CT scan of the entire abdomen revealed the presence of abdominal and pelvic fluid, mesentery turbidity, postoperative changes in the gallbladder, and a greater aggregation of intestinal contents. Following admission, the patient was treated with a water fast, antispasmodics, gastric protection, acid suppression, and other therapeutic measures. The patient did not report any notable discomfort during the course of the treatment. On 9 September 2022, an abdominal CT enhancement indicated an increase in abdominal and pelvic fluid (**Figure 1**). Consequently, a CT-guided puncture drainage procedure was performed, and the fluid was observed to be bile-like. Additionally, abdominal tube drainage was initiated, with the output recorded daily (**Figure 2**). Following a postoperative review of the entire abdominal CT, no significant effusion was evident (**Figure 3**). The tube was subsequently removed, and the patient was discharged from the hospital on 17 September 2022, having demonstrated improvement. During the

course of their hospital stay, no significant complications were identified. The postoperative follow-up period was one year, during which the patient did not experience any significant discomfort.

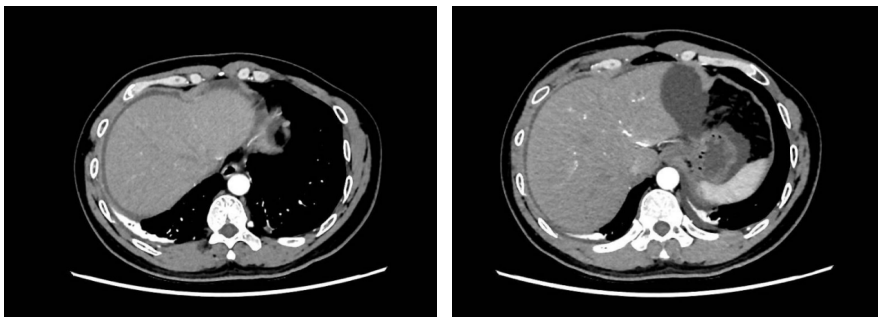

Figure 1. The enhancement scan results indicate an increase in the presence of fluid within the abdominal and pelvic regions.

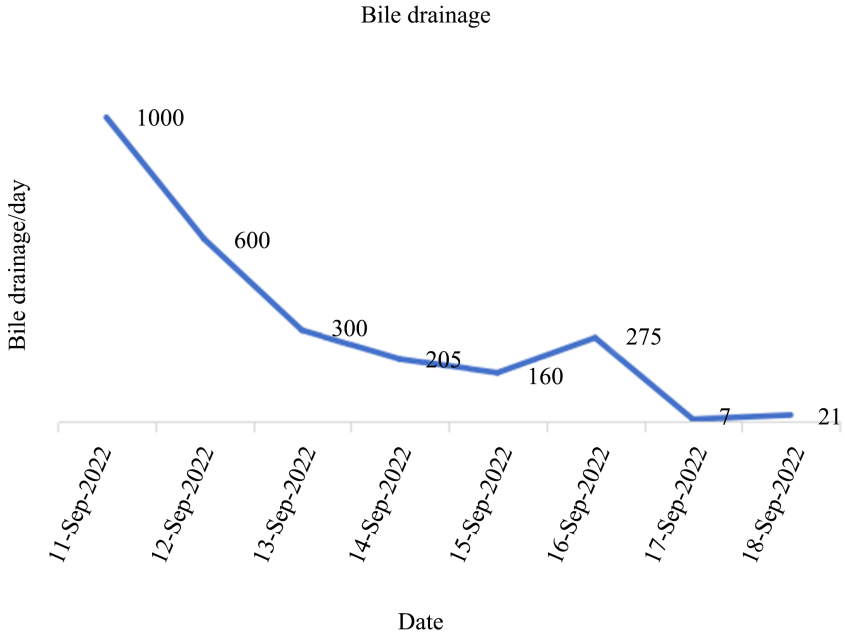

Figure 2. The results demonstrate the efficacy of the intervention in facilitating daily bile drainage.

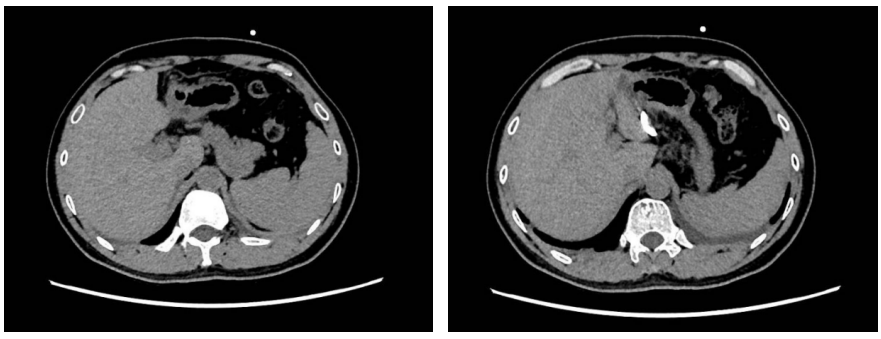

Figure 3. A computed tomography scan of the entire abdomen indicates the absence of a notable effusion.

3. Discussion

Bile leakage was classified as either immediate or delayed, with a 72-hour threshold employed to differentiate between the two categories [8] [9]. The former occurs predominantly as a consequence of the dislodgement of titanium clips (or bioclips) or an incomplete clamping of the bile duct. The latter is predominantly linked to the insidious effects of thermal damage, the bile ducts can still maintain their integrity in the early stages of thermal injury. However, following a period of 72 hours, coagulative necrosis occurs in the entire duct wall. Subsequently, small foci of necrosis begin to liquefy, form a crust, and perforate, resulting in bile leakage [10] [11]. In the initial phase, the limited quantity of bile leakage results in clinical manifestations that are analogous to those of gastrointestinal perforation and acute pancreatitis. Consequently, establishing a diagnosis based solely on these manifestations is challenging. The following points may be employed as reference criteria for the confirmation of a diagnosis of delayed bile leakage: 1) Any auxiliary examination suggests that the abdominal fluid, especially in the area of the lower edge of the liver under the lower edge or the lateral edge of the liver, is significantly increased. 2) Diagnostic laparotomy to extract or drain bile, or ERCP to see contrast spillage into the biliary tract [12] [13]. It is this author's opinion that all patients admitted to the clinic with unexplained abdominal pain who have undergone previous laparoscopic cholecystectomy should be made aware of the possibility of delayed bile leakage. As few surgeons retain video documentation of their surgical procedures, delayed bile leakage resulting from intraoperative damage to the bile ducts is uncommon, making it challenging to ascertain the source of the leakage. The author puts forth the following hypotheses regarding the aetiology of the bile leakage, based on the surgical procedure: 1) When the surgeon manipulates the gallbladder triangle, the instruments are often positioned too close to the bile ducts, resulting in injury to the latter. Due to the limited extent of this injury and the small size of the ducts, the integrity of the ducts is maintained in the early postoperative period. However, as the postoperative period progresses, the necrotic tissues become dislodged, leading to delayed bile leakage. Injuries to the vagus bile duct in the gallbladder bed are the most common, as the vagus bile duct is often located in the plasma membrane of the gallbladder at the anticlinal folds, which renders it susceptible to injuries that are challenging to detect. 2) In the event of excessive intraoperative stripping of the gallbladder, there is an increased risk of bile duct injury. If the procedure is performed too deeply into the hepatic parenchyma, it can result in injury to the intrahepatic terminal branch of the bile duct. Moreover, if the procedure is performed excessively deeply, it can also result in damage to the right hepatic duct [14]. Furthermore, excessive pursuit of cystic duct skeletonisation by the operator during the process of freeing the cystic duct can also result in bile duct injury. 3) The probability of bile leakage caused by the displacement of the cystic duct by either a titanium clip or a bioclip is 0.4% to 2.0% [15]. This phenomenon is most commonly observed in cases

of immediate-onset bile leakage, although it has also been documented in a few instances of delayed bile leakage. The risk of bile leakage is also increased by the clamping of the bile duct when it is thickened due to inflammation and oedema. It has been argued that it is more prudent to ligate the bile ducts with a wire ligation when handling the bile ducts, especially those of more than 1.0 cm in diameter [16]. 4) Gallbladder surgery frequently entails exposure of the hepatic and biliary systems, incision, and other procedures that may result in bile duct injury if the operator is not meticulous. Consequently, the proficiency of the operator, the selected surgical method and the type of incision all have a significant impact on the incidence of bile leakage. 5) Patients with underlying health conditions, such as advanced age or diabetes, often exhibit impaired tissue repair capabilities [17] [18]. This is a crucial factor contributing to the development of bile leakage in these individuals, and it warrants particular attention.

The treatment of delayed bile leakage must be considered in light of a multitude of contributing factors. In the author's opinion, the following approaches may be considered: 1) Simple abdominal drainage may be an appropriate choice if the bile leakage is small and there is a smooth drainage of the abdominal drainage tube at the time of occurrence. 2) Percutaneous peritoneal drainage may be a suitable option if the peritoneal effusion is confined or encapsulated. This approach may include ultrasound-guided percutaneous peritoneal drainage and percutaneous transhepatic cholangial drainage (PTCD), among others. In a retrospective analysis of 63 cases of bile leakage patients treated with percutaneous hepatic puncture biliary drainage, De Jong [19] found that the cure rate could reach 69.8%. The optimal location for tube placement is the lowest, deepest, and most secure area of effusion [20]. In female patients with limited effusion in the lower abdomen and pelvis, posterior dome puncture tube placement, combined with a semirecumbent drainage position, can effectively drain the effusion while maintaining the best drainage effect. 3) Endoscopic treatment may be selected for patients exhibiting inadequate drainage via drain. This encompasses endoscopic retrograde cholangiopancreatography (ERCP), endoscopic sphincterotomy (EST), endoscopic nasociliary drainage (ENBD) and endoscopic retrograde biliary drainage (ERBD). These techniques have a cure rate exceeding 80% [21], and may be employed individually or in combination, contingent on the clinical circumstances. 4) For Patients with bile leakage whose location is difficult to determine, whose bile leakage cannot be controlled after non-surgical treatment, and/or who have diffuse peritonitis, surgery is still the first choice and open or laparoscopic surgery is selected according to the patient's own situation. In addition, bile leaks often cause bacteraemia, which may include gram-positive, gram-negative and/or anaerobic bacteria, and surgical and endoscopic interventions are accompanied by the use of broad-spectrum intravenous antibiotics. Penicillin, cephalosporins, aminoglycosides, ricosamide, fluoroquinolones, and carbapenem antibiotics [22] have shown promising results in the treatment of sepsis-associated bile leakage.

While the occurrence of delayed bile leakage cannot be entirely eliminated, it

can be effectively prevented. The following points represent potential starting points for such an endeavour: 1) It is imperative to ensure the precise anatomy of the gallbladder triangle. When dealing with the gallbladder triangle, it is recommended to opt for blunt separation in order to maintain an unobstructed surgical field. Additionally, it is advised to refrain from overly pursuing the skeletonisation of the gallbladder duct and gallbladder artery, in order to prevent injury to the trophoblastic vessels. It has been proposed that a 5-second pause to ascertain a secure field of view of the anterior and posterior triangles prior to the dissection of the gallbladder duct may markedly reduce the likelihood of bile duct injury [23]. In the event of encountering fibrous strips of tissue that are difficult to determine, it is recommended that they be clamped shut before proceeding with the dissection process [24]. Such tissue should not be risked. 2) The inappropriate utilisation of high-frequency electric knives represents an independent risk factor that may result in biliary tract injury [25]. Some scholars have proposed that the significance of ensuring electrostatic-free operation within the gallbladder triangle should be emphasised [26]. Preoperative inspection of operating instruments is essential, and any instruments exhibiting a broken insulation layer should be promptly replaced to prevent intraoperative damage caused by direct discharge of the broken parts to contact tissue. In the context of the gallbladder triangle, it is advisable to opt for non-electric operations and to refrain from utilising high-power and prolonged electrocoagulation techniques. This approach is intended to prevent heat conduction damage to the biliary tract. 3) It is recommended that non-conductive receiveable bioclips or silk threads be used, as these can effectively avoid titanium clip-mediated electrocautery injuries. 4) Surgeon' experience is also a significant factor. Studies have demonstrated that the risk of bile duct injury for the first laparoscopic cholecystectomy is 1.7%, while for the 50th case, this risk is reduced to 0.17% [27]. 5) In cases where the surgeon has a poor understanding of intraoperative anatomy, regardless of whether or not there is an intraoperative bile leakage, the retention of abdominal drainage tubes should be considered. In such cases, the time for removing the drainage tube can be appropriately prolonged to reduce the invasive nature of the subsequent operation in the event of a bile leakage. The amount of bile drained from the abdominal drainage tube after surgery has a certain localisation effect on the leakage, which is of some significance in the choice of treatment plan. 6) Preoperatively, it is imperative to actively correct the patient's basal state, control blood glucose levels, and so forth. In diabetic patients, non-absorbable material ligation, clip ligation of the gallbladder duct can be employed [28]. In conclusion, the author postulates that the operator should treat each step of the operation with the utmost caution, eschewing any undue risks. Meticulous intraoperative care and strict adherence to the requisite standards are pivotal in preventing delayed bile leakage in the postoperative period.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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