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Case Report

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Restoration of Bile Outflow and Liver Revascularization After Cholecystectomy with Damage to the Hepaticocholedochus and Thrombosis of the Right Hepatic Artery

M.O. Movsisyan ✉, ***A.V. Novozhilov, S.E. Grigorev***

Department of Hospital Surgery
Irkutsk State Medical University
1, Krasnogo Vosstaniya Str., Irkutsk 664003, Russian Federation
Irkutsk Regional Clinical Hospital
100, Yubileiny microdistrict, Irkutsk 664049, Russian Federation

✉ **Contacts:** Mikael O. Movsisyan, Assistant at the Department of Hospital Surgery, Irkutsk State Medical University; Surgeon. Email: mov-mik@yandex.ru

ABSTRACT The problem of iatrogenic damage to the extrahepatic bile ducts during cholecystectomy remains relevant. Insufficient experience of the surgical team, limited knowledge of the topographic anatomy of the subhepatic space, especially in conditions of perivesical inflammatory infiltrate, poorly timed access conversion are some of the main reasons.

The results of treatment of these patients depend on the timing of recognition of the injury, the type of the injury, the characteristics of reintervention, and timely reconstructive surgery performed in a specialized center. Up to 30 % of damage occurs due to combined injury to the extrahepatic bile ducts and afferent vessels of the liver, which aggravates the course of the disease.

We report a clinical case of a female patient. The fragment of the hepaticocholedochus was excised during a planned cholecystectomy. In the same clinic, the primary reconstructive operation was performed (drainage of the hepaticocholedochus using a Kehr's drain). Afterwards, an external fistula of the common hepatic duct was formed. The reconstructive operation was performed 4 days after the initial operation, in a specialized department of the regional clinical hospital. Relaparotomy was performed. In a dense inflammatory infiltrate during mobilization of the suspected hepaticocholedochus, a Kehr's drain was identified, which distal branch was not located in the lumen of the bile duct. Thrombosis of the right hepatic artery was diagnosed. The Kehr's drain was removed, the lobar ducts were identified to their confluence, and the confluence was preserved. The distal stump was sutured. Next, arteriotomy and thrombectomy were performed, and adequate retrograde and antegrade blood flow was recoverd. A hepaticoenteroanastomosis has been formed. The patient was discharged with recovery. When examined after 2 months, the condition was satisfactory. Timely diagnosis of thrombosis of the right hepatic artery, adequate revascularization and biliary reconstruction made it possible to avoid liver necrosis and achieve a good treatment outcome.

Keywords: laparoscopic cholecystectomy, bile duct injury, hepatic vascular injury, external fistula, common hepatic duct, bile duct reconstruction

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AffiliatiXons

Mikael O. Movsisyan	Assistant of the Department of Hospital Surgery of the Irkutsk State Medical University, Surgeon of the Department of Portal Hypertension, Irkutsk Regional Clinical Hospital; https://orcid.org/0000-0003-2070-9263, mov-mik@yandex.ru; 50%, observation and treatment of the patient, performing surgery, collecting literature, writing the text of the article
Aleksandr V. Novozhilov	Candidate of Medical Sciences, Associate Professor of the Department of Hospital Surgery, Irkutsk State Medical University, Head of the Department of Portal Hypertension, Irkutsk Regional Clinic; https://orcid.org/0000-0003-1957-287X, novojilov_av@mail.ruu; 30%, performing surgery, collecting literature, writing the text of the article, designing the article
Sergey E. Grigorev	Candidate of Medical Sciences, Associate Professor of the Department of Hospital Surgery, Irkutsk State Medical University, Surgeon of the Portal Hypertension Department, Irkutsk Regional Clinical Hospital; https://orcid.org/0000-0003-0254-8240, grigorievse@gmail.com; 20%, text writing, article design

EBD – extrahepatic bile ducts

CHD – common hepatic duct

Due to the rapid introduction of laparoscopic technologies, the incidence of extrahepatic bile duct (EBD) injuries, including coagulation injuries, during cholecystectomy reaches 2.7% [1, 2]. In 13.8–26.0% of cases, damage to the EBD is combined with dissection of liver vessels [3]. The results of treatment of these patients depend on the timing of recognition of the injury, the nature of the injury, the characteristics of reintervention, and timely reconstructive surgery performed in a specialized center [4, 5]. *N. Gurta et al.* note that in 3 out of 4 patients with the pathology discussed, necrosis and (or) liver abscesses were observed in the immediate postoperative period, and in half of them, failure of the biliary anastomosis was detected [6]. According to *S. Truant,* in patients with combined injuries of the IVH and arteries (type *E* 4 or *E* 5 according to the *Strasberg classification*), the likelihood of liver resection is 40-fold higher than with isolated injuries of the ducts [7]. Timely liver revascularization in combination with hepaticojejunostomy allows achieving a positive result in 81.8% of cases [8].

Clinical observation

A 53-year-old woman was admitted with a referral diagnosis of incomplete external biliary fistula. From the anamnesis it was established that on April 22, 2022, laparoscopy was performed at the place of residence for acute calculous cholecystitis. There was an infiltration in the subhepatic space, a subcostal laparotomy was performed, cholecystectomy from the cervix with technical difficulties, a catch drain was installed in the subhepatic space. After 3 hours, bile flows through the catching drain. On April 26, 2022 repeated laparotomy was performed. The lesion of the hepaticocholedochus was detected. Kehr drain was installed. On the 4th day after surgery, she was sent to a regional hospital for further treatment.

Upon admission, the condition was severe, stable, consciousness was clear, the skin and visible mucous membranes were pale pink, with normal moisture. Vesicular breathing heard in all parts, no wheezing. The tongue is moist, the stomach is symmetrical. In the right hypochondrium, a postoperative wound 12 cm long in satisfactory condition. Light bile flows through the Kehr drainage. Along the midaxillary line on the right there were two drainage tubes with similar discharge.

When palpating the abdominal wall, there was pain in the surgical area. Complete blood count: WBC 13.20×10^{9}/l, RBC 3.8×10^{12}/l hemoglobin 98 g/l. Other indicators are within reference values. Biochemical blood test: increased AST to 84.20 IU/l, ALT to 69.400 IU/l, alkaline phosphatase to 136.00 IU/l, gamma-glutamyltransferase to 104.50 IU/l.

MSCT angiography and MRI cholangio-pancreatography were performed. The liver after contrasting has a heterogeneous structure (right lobe up to 60 N units, left up to 90 N units), there are signs of ischemia of the right lobe. In the arterial phase, a contrast enhancement defect in the right hepatic artery was detected (Fig. 1, 2).

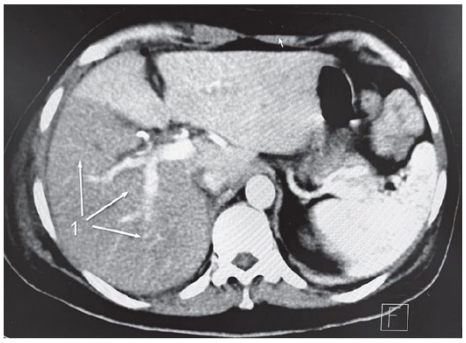

Fig. 1. MSCT angiography scan. 1 — right lobe of the liver with signs of ischemia

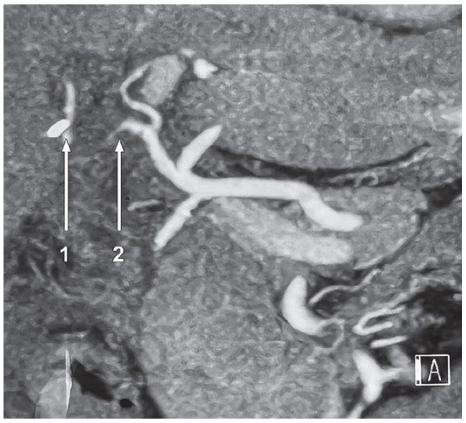

Fig. 2. MSCT angiography scan. 1 — distal segment of the right hepatic artery; 2 — proximal stump of the right hepatic artery

On MRI cholangiography, the intrahepatic ducts are visualized to the subcapsular sections, but are not dilated. The lobar ducts merge at the porta hepatis, are not dilated, without filling defects. The common hepatic duct (CHD) is visualized only in the intrapancreatic part. Between the confluence and the visualized part of the common bile duct there is a defect of 52 mm in length. There is a diversion of bile into the subhepatic space, where a catching drain is installed (Fig. 3).

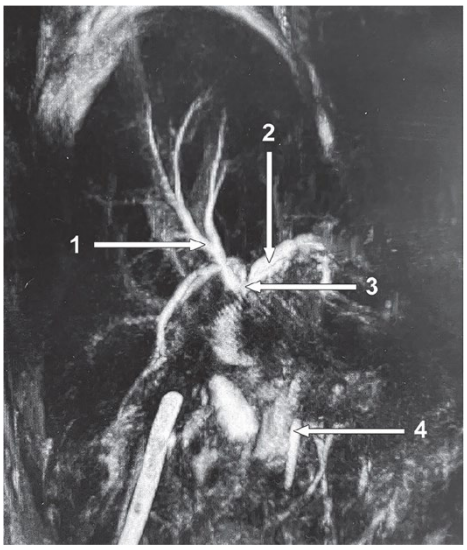

Fig. 3. MR cholangiography scan. 1 — left lobar duct; 2 — right lobar duct; 3 — proximal stump of hepaticocholedochus; 4 — distal stump of hepaticocholedochus

Fistulography: the proximal branch of the Kera drainage is located in the lumen of the left lobar duct, the distal branch is outside the lumen of the hepaticocholedochus (Fig. 4).

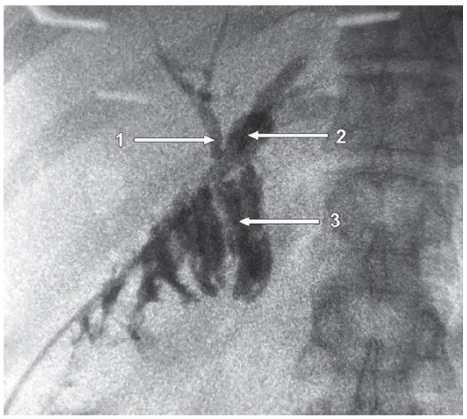

Fig. 4. Fistulography. 1 — proximal branch of Kehr's drain in the lumen of the left lobar bile duct; 2 — distal branch of the Kehr'r drain outside the lumen of the hepaticocholedochus; 3 — right lobar bile duct

A diagnosis was made: "Damage to the EBD, E3 variant according to *S. Strasberg* or "0" according to Galperin; complete external biliary fistula, damage to the right hepatic artery?

On April 28, 2022, relaparotomy was performed. There is infiltration in the subhepatic space. During mobilization of the suspected CHD, a Kehr drain was discovered, the distal branch of which is located outside the lumen of the hepaticocholedochus. The anterior wall of the duct is absent for 50 mm, the posterior wall is represented by a necrotic fragment. Kera drain removed. Abundant flow of bile. Necrotic fragments of the wall of the CHD were excised. The distal stump is stitched and bandaged. The walls of the right and left lobar ducts before their confluence are highlighted. Confluence is preserved. The right hepatic artery does not pulsate—thrombosis (Fig. 5).

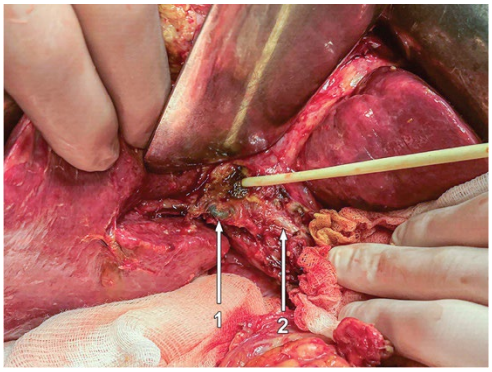

Fig. 5. Intraoperative photo. 1 — distal branch of the Kehr's drain; 2 — thrombosed right hepatic artery

Arteriotomy, thrombectomy, adequate retrograde and anterograde blood flow was obtained, vascular suture (Prolene 6/0), blood flow was restored.

The loop of the small intestine is disconnected according to *Roux*, a hepaticojejunostomy is formed at 80 cm with separate sutures using *PDS* 5/0 thread with drainage of the bile ducts according to Felker (Fig. 6). Silicone drainage was installed in the subhepatic space.

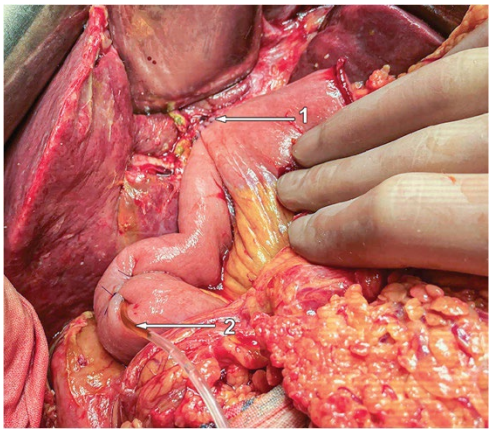

Fig. 6. Intraoperative photo. 1 — formed hepaticojejunostomy; 2 — Felker drain

The early postoperative period was uneventful; the catching drain was removed on the 4th day after the intervention. On the 6th day, a control fistulography was performed, right and left lobar and common hepatic ducts are filled, the contrast freely enters the small

intestine. She was discharged in satisfactory condition with the Felker drain closed under the supervision of a surgeon at her place of residence.

Examined two months after surgery. Complains of minor discomfort in the paradrainage area, general condition is satisfactory. On control ultrasound, the bile ducts are not dilated. Drainage removed.

DISCUSSION

The presented observation analyzes organizational, tactical and technical errors that complicated the reconstructive stage of treatment. Damage to the hepaticocholedochus and thrombosis of the right hepatic artery were not diagnosed in a timely manner. Despite bile leakage through the catch drain, a repeat operation was performed on the 4th day. Prosthetic replacement of the defect (50 mm) of the hepaticocholedochus with Kehr drainage did not solve the problem of bile outflow; moreover, it compromised the remaining part of the CHD.

The prevention of damage to the tubular structures of the hepatoduodenal ligament when performing cholecystectomy is based on the principles of a "critical view of safety", which minimize complications and ensure the reliability of the operation.

In the observation under discussion, access conversion was done on time; subsequently, the principle of critical assessment of the situation was not observed. After damage to the ducts, attempts to reconstruct the biliary tree with insufficient experience in this section of surgery, as a rule, lead to a reduction in the segment of the hepatic duct that is promising for restoration [9] and high postoperative mortality, reaching 13–25% [10].

CONCLUSIONS

1. The most common mistakes when performing cholecystectomy are non-compliance with the principles of a "critical view of safety", late diagnosis of complications, attempts to immediately perform restorative and reconstructive interventions without appropriate experience.

2. In addition to ongoing intra-abdominal bleeding, the only indication for re-operation at the site of cholecystectomy is the presence of biliary peritonitis. It is necessary to carry out an inspection, sanitation of the abdominal cavity, visualization of the source of bile leakage, external drainage of the subhepatic space and transportation of the patient to a specialized center.

3. In the above observation, timely diagnosis of thrombosis of the right hepatic artery, adequate revascularization and biliary reconstruction made it possible to avoid liver necrosis and achieve adequate bile outflow.

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