

Case study

IATROGENIC RIGHT HEPATIC DUCT, RIGHT POSTERIOR HEPATIC DUCT, RIGHT HEPATIC ARTERY AND DUODENUM INJURY DURING ROUTINE LAPAROSCOPIC CHOLECYSTECTOMY DUE TO SYMPTOMATIC GALLSTONES: RARE BUT SERIOUS COMPLICATION - CASE REPORT AND LITERATURE REVIEW

ABSTRACT:

Laparoscopic cholecystectomy is a very frequent surgical procedure with a low complication rate. The reasons for such complications range from anatomical anomalies, obesity, poor exposure of anatomic structures, bleeding or lack of surgical experience. If complications arise, prompt recognition and correct management are essential. Early and correct treatment allows avoidance of serious complications, such as secondary biliary cirrhosis, hepatic failure, and ultimately death. In this paper is presented a case of a 40-years-old male patient, who sustained iatrogenic major bile duct, right hepatic artery and duodenum injury during routine laparoscopic cholecystectomy due to symptomatic gallstones.

KEY WORDS: laparoscopic cholecystectomy, bile duct injury, conversion.

INTRODUCTION:

Laparoscopic cholecystectomy is the standard surgical procedure for symptomatic cholelithiasis. Although it lowers the postoperative morbidity and mortality, injuries of bile ducts and other structures are more common (0–2.7%), compared to open surgery (0.2–0.5%) (1). Most of the literature reports are on bile duct injuries, while descriptions of coexisting vascular and bowel injuries are rare, probably widely underestimated as the incidence is unknown (2). Duodenal injuries are extremely rare complications and often go unrecognized at the time of the procedure and manifest later with significant morbidity and mortality (3).

We describe a case report showing rare **but** serious complications during routine laparoscopic cholecystectomy, which were overlooked during the procedure itself. **This paper presented a case of a serious bile duct injury during routine laparoscopic cholecystectomy and further discussed about diagnosis and treatment of such injuries.**

CASE PRESENTATION:

A 40-years old male patient was admitted to a general hospital, with tenderness and pain below the right costal margin. The laboratory results were in a normal range, except for the minor elevation of leukocytes ($12,6 \times 10^9/L$). The ultrasound showed a 12 mm gallstone in the infundibulum and some smaller gallstones in the lumen of the gallbladder without any signs of inflammation.

44 The patient underwent elective cholecystectomy the next day. The surgical report described a
45 **dense** adhesions between the **proximal duodenum** and the lower half of the gallbladder which
46 were resolved during the procedure. Due to hemorrhage, cystic artery and cystic duct were
47 clipped. The source of the bleeding was most probably attributed to an accessory artery.
48 Because of accidental perforation of the gallbladder during dissection from the liver bed, the
49 abdominal cavity was washed with saline and the patient received empirical antibiotic
50 treatment (Metronidazole and Amoxicillin / Clavulanic acid). Abdominal drains were inserted at
51 the end of surgery.

52 On the first postoperative day, the patient was feeling well. There was **around 600 ml of brown**
53 **fluid** in the bulb of the drainage system, that ceased later in the day.

54 **In the next few days** the patient's condition gradually deteriorated with diffuse pain in the
55 abdomen and increased collection of bile from the abdominal drains. The blood tests showed
56 an elevation of inflammatory parameters and cholestasis markers (CRP 412 mg/L, direct
57 bilirubin 19,3 $\mu\text{mol/L}$, total bilirubin 26,0 $\mu\text{mol/L}$, γ -glutamyl transpeptidase 1,37 $\mu\text{kat/L}$,
58 procalcitonin 2,65 $\mu\text{g/L}$, leukocytes 11,4 x $10^9/\text{L}$). ALT and AST were **within normal range**.
59 Antibiotic treatment with Imipenem/Cilastatin was commenced.

60 Computed tomography (CT) scan showed a considerable collection of free fluid and gas in the
61 perihepatic and Douglas space. **Duodenal bulb** showed signs of early abscess formation with a
62 collection of fluid. The common bile duct was not visible on CT.

63 The patient was transferred to the tertiary hospital for further treatment. After admission,
64 endoscopic retrograde cholangiopancreatography (ERCP) was performed as a preoperative
65 diagnostic method which showed a defect in the **duodenal bulb**, roughly 1 cm in size. The
66 common hepatic duct was not seen on the ERCP. After a short period of preoperative
67 preparation, the patient underwent explorative laparotomy, where signs of biliary peritonitis
68 were found. At further abdominal exploration, a complex injury of the right hepatic duct and
69 previously undescribed perforation of the **proximal** duodenum was discovered. The duodenal
70 perforation was closed with interrupted sutures. The distance between both ends of injured
71 right hepatic duct was **too** long for primary reconstruction, therefore a Roux-en-Y
72 hepaticojejunal anastomosis was fashioned.

73 Postoperatively there was still a considerable amount of bile fluid drained from the abdominal
74 cavity and the **patient's** condition did not improve satisfactorily. Further surgical revision was
75 indicated. At second revision additional injury of the posterior right hepatic duct for the right
76 posterior section was discovered. The perfusion of the right hepatic lobe was questionable. The
77 injury of the right hepatic artery was suspected. Two more hepaticojejunal anastomoses were
78 made, one to the left bile ducts and anterior section, the other to the segmental duct for the
79 6th hepatic segment. Bile duct for the 7th hepatic segment was injured and could not be
80 reconstructed, therefore it was closed without anastomosis. Hepaticojejunal anastomoses were
81 bridged with T- drains to lower the bile secretion through abdominal drains. Following surgery,
82 there was still a minor quantity of bile drained from the abdomen that ceased with the
83 restoration of normal peristaltic function.

84 **During follow-up, several ultrasound examinations were performed and there was no sign of**
85 **fluid collection**. With antibiotic therapy, the inflammatory parameters started to **restore**.

86 The patient was discharged for a few days and came back for a control ultrasound, showing
87 minor fluid collections. Inflammatory parameters were falling, but hepatic enzymes were rising

88 (alkaline phosphatase: 12,07 μ kat/L, AST: 3,61 μ kat/L, ALT: 6,63 μ kat/L, γ -glutamyl
89 transpeptidase 21,11 μ kat/L, lipase: 2,20 μ kat/L, CRP: 37 mg/L, direct bilirubin: 11 μ mol/L). The
90 patient was discharged with diet instructions and scheduled outpatient visits to the hospital.
91 The T-drains were removed at further outpatient clinic follow-ups.

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94 **DISCUSSION:**

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96 Laparoscopic cholecystectomy is a gold standard for treating symptomatic cholelithiasis as it
97 allows a safe, quick and minimally invasive approach. Complications are rare but have to be
98 carefully and critically analyzed to learn from these mistakes (4). In the literature, the
99 percentage of LC complications is directly related to surgeon's experience, which is expressed
100 in numbers per year (5,6). The main reason for complications is the degree of inflammation, the
101 adhesions and the anatomic variations which inflict as many as 50% of cases. The first surgeon,
102 who performed LC in other hospital, was a junior specialist, however overall he performed
103 more than 100 LC. Every surgeon, who is performing LC, must have a critical view of safety
104 during surgery. If there is unclear anatomical situation, in which the surgeon is not sure,
105 whether he is ligating and dividing the proper structure, a low threshold for conversion to open
106 surgery must exist.

107 To compare the extent of injury, many different classification systems have been introduced.
108 Bismuth classification was the base for all the following versions and it evaluates the location of
109 the injury in the biliary tract, dividing them into five types according to the distance from the
110 hilar structure. Strasberg classification is a more recent version, adopted for the laparoscopic
111 procedures, where the injuries occur in a different pattern compared to those seen in open
112 cholecystectomy. Stewart-Way classification is a simple and effective classification of
113 laparoscopic bile duct injuries which also incorporates vascular injuries (7).

114 The surgical repair of injured structures depends on the time and extent of the injury. If
115 immediate repair is possible, even a completely transected bile duct can be primarily
116 reconstructed as an end-to-end ducto-ductal anastomosis. For this procedure the edges should
117 be healthy, without any inflammation, ischemia or fibrosis, with proper vascularization of the
118 anastomosis. In case of late identification of injury, when a revision surgery has to be done, the
119 goal of surgical repair should be the establishment of a bilio-enteric anastomosis, Roux-en-Y
120 hepaticojejunostomy (8).

121 The patient that underwent LC needs to be followed up thoroughly to notice various clinical
122 signs, laboratory changes with prompt radiological investigations in order to diagnose the injury
123 of bile ducts and other structures in proper time. In laboratory results, special attention must
124 be given to serum bilirubin, alkaline phosphatase, γ -glutamyl transpeptidase, alanine and
125 aspartate aminotransferases as well as the inflammatory markers (7). In the early stage, when
126 the liver is not damaged, the indicators of cholestasis can be elevated, which was also observed
127 in our case, but AST and ALT can still be in the normal range. Later these parameters can
128 elevate as a result of secondary biliary hepatic damage. If the synthetic function of the liver is
129 compromised as well, changes in coagulation and hypoalbuminemia can occur. (9).

130 It is important to keep in mind that normal laboratory results do not exclude bile duct injury, as
131 they sometimes need few weeks to rise above normal values, therefore clinical signs and

132 drained fluids must be observed closely (8). One of the studies showed that the median time of
133 the patient's presentation was 7 days after laparoscopic cholecystectomy and 14 days following
134 open cholecystectomy (10)

135 Radiological investigations for detecting bile duct injuries are ultrasound, cholangiography,
136 ERCP, CT and magnetic resonance cholangiopancreatography (MRCP) (11). Cholangiography can
137 be done intraoperatively, to clarify biliary anatomic variations and reveal occult common bile
138 duct calculi (12). ERCP can be, apart from diagnostic values, used also as a treatment. It enables
139 the localization of the injured region and therapeutic maneuvers, such as stent placement and
140 extraction of calculi (11). In our case, ultrasound and CT were performed in the first hospital,
141 ERCP being done later in a tertiary hospital. Postoperatively more ultrasounds were done as a
142 follow-up (13,14).

143 The literature describes many cases of bile duct injuries after LC but rarely as extensive as in
144 this case. Keeping in mind, that cholecystectomy is considered a minor surgery, complications
145 like these can lead to a poor outcome as the patients are often committed to a long period of
146 follow-ups (15,16,17). **Biliary injury in our case was type E biliary injury, which is the heaviest**
147 **(18).**

148

149 **CONCLUSION:**

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151 Our case report shows an extensive injury made during LC, inadequate first revision surgery,
152 but critical observation of the patient, which led to successful second revision surgery. Although
153 we can minimize the risk of injuries during LC, they cannot be completely avoided. In case of
154 insecurities, a low threshold for conversion to the open procedure is advised. If revisions are
155 needed, reconstruction should be made by an experienced hepatobiliary surgeon in a tertiary
156 hospital (13).

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158 Disclosure statement: The author has no financial or other conflicts of interests to declare.

159

160 **Consent Disclaimer:**

161 As per international standard or university standard, patient's written consent has been
162 collected and preserved by the authors.

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