

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. The article demonstrates the symptoms and signs of perioperative complications and laboratory and radiology markers needed to help us to diagnose the complications and the basic principles how to manage such complications.

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 big gallstone in the

43 infundibulum of the gallbladder and some smaller gallstones in the lumen of the gallbladder
44 without signs of inflammation.

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

53 On the first postoperative day, the patient was feeling well. There was some collection of blood
54 and bile in the bulb of the drainage system, that ceased later in the day.

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

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

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

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

85 Multiple abdominal ultrasound checks were made as a follow-up without any sign of fluid
86 collection. With antibiotic therapy, the inflammatory parameters started to decrease.

87 Additional contrast imaging through both T-drains showed one of them located in the blind
88 loop and the other only partly passable, but without any flow out of lumen or reflux back to bile
89 ducts.

90 The patient was discharged for a few days and came back for a control ultrasound, showing
91 minor fluid collections. Inflammatory parameters were falling, but hepatic enzymes were rising.
92 (alkaline phosphatase: 12,07 $\mu\text{kat/L}$, AST: 3,61 $\mu\text{kat/L}$, ALT: 6,63 $\mu\text{kat/L}$, γ -glutamyl
93 transpeptidase 21,11 $\mu\text{kat/L}$, lipase: 2,20 $\mu\text{kat/L}$, CRP: 37 mg/L, direct bilirubin: 11 $\mu\text{mol/L}$). The
94 patient was discharged with diet instructions and scheduled outpatient visits to the hospital.
95 The T-drains were removed at further outpatient clinic follow-ups.

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98 **DISCUSSION:**

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100 Laparoscopic cholecystectomy is a gold standard for treating symptomatic cholelithiasis as it
101 allows a safe, quick and minimally invasive approach. Complications are rare but have to be
102 carefully and critically analyzed to learn from these mistakes (4).

103 To compare the extent of injury, many different classification systems have been introduced.
104 Bismuth classification was the base for all the following versions and it evaluates the location of
105 the injury in the biliary tract, dividing them into five types according to the distance from the
106 hilar structure. Strasberg classification is a more recent version, adopted for the laparoscopic
107 procedures, where the injuries occur in a different pattern compared to those seen in open
108 cholecystectomy. Stewart-Way classification is a simple and effective classification of
109 laparoscopic bile duct injuries which also incorporates vascular injuries (5).

110 The surgical repair of injured structures depends on the time and extent of the injury. If
111 immediate repair is possible, even a completely transected bile duct can be primarily
112 reconstructed as an end-to-end ducto-ductal anastomosis. For this procedure the edges should
113 be healthy, without any inflammation, ischemia or fibrosis, with proper vascularization of the
114 anastomosis. In case of late identification of injury, when a revision surgery has to be done, the
115 goal of surgical repair should be the establishment of a bilio-enteric anastomosis, Roux-en-Y
116 hepaticojejunostomy (6).

117 The patient that underwent LC needs to be followed up thoroughly to notice various clinical
118 signs, laboratory changes with prompt radiological investigations in order to diagnose the injury
119 of bile ducts and other structures in proper time. In laboratory results, special attention must
120 be given to serum bilirubin, alkaline phosphatase, γ -glutamyl transpeptidase, alanine and
121 aspartate aminotransferases as well as the inflammatory markers (5). In the early stage, when
122 the liver is not damaged, the indicators of cholestasis can be elevated, which was also observed
123 in our case, but AST and ALT can still be in the normal range. Later these parameters can
124 elevate as a result of secondary biliary hepatic damage. If the synthetic function of the liver is
125 compromised as well, the changes in coagulation and hypoalbuminemia can occur. (7).

126 It is important to keep in mind that normal laboratory results do not exclude bile duct injury, as
127 they sometimes need few weeks to rise above normal values, therefore clinical signs and
128 drained fluids must be observed closely (6). One of the studies showed that the median time of
129 the patient's presentation was 7 days after laparoscopic cholecystectomy and 14 days following
130 open cholecystectomy (8)

131 Radiological investigations for detecting bile duct injuries are ultrasound, cholangiography,
132 ERCP, CT and magnetic resonance cholangiopancreatography (MRCP) (9). Cholangiography can
133 be done intraoperatively, to clarify biliary anatomic variations and reveal occult common bile
134 duct calculi (10). ERCP can be, apart from diagnostic values, used also as a treatment. It enables
135 the localization of the injured region and therapeutic maneuvers, such as stent placement and
136 extraction of calculi (9). In our case, ultrasound and CT were performed in the first hospital,
137 ERCP being done later in a tertiary hospital. Postoperatively more ultrasounds were done as a
138 follow-up (11,12).

139 The literature describes many cases of bile duct injuries after LC but rarely as extensive as in
140 this case. Keeping in mind, that cholecystectomy is considered a minor surgery, complications
141 like these can lead to a poor outcome as the patients are often committed to a long period of
142 follow-ups (13,14,15).

143

144 **CONCLUSION:**

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146 Our case report shows an extensive injury made during LC, inadequate first revision surgery,
147 but critical observation of the patient, which led to successful second revision surgery. Although
148 we can minimize the risk of injuries during LC, they cannot be completely avoided. In case of
149 insecurities, a low threshold for conversion to the open procedure is advised. If revisions are
150 needed, reconstruction should be made by an experienced hepatobiliary surgeon in a tertiary
151 hospital (11).

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

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