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# BILE DUCT INJURIES IN DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY

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**ABSTRACT**

*LAPAROSCOPIC CHOLECYSTECTOMY HAS QUICKLY BECOME THE OPTIMAL THERAPEUTICAL OPTION IN THE CASE OF GALLBLADDER LITHIASIS BECAUSE OF HIS MINIMALLY INVASIVE TECHNIQUE, REDUCED POSTOPERATIVE PAIN, FASTER RECOVERY, SHORTER HOSPITALIZATION, AND AS A WHOLE, REDUCTION OF THE HOSPITALIZATION COSTS.*

*WE STUDIED 3595 CASES OF LAPAROSCOPIC CHOLECYSTECTOMIES PERFORMED IN THE 4TH GENERAL SURGERY CLINIC IN CRAIOVA BETWEEN 2001 AND 2015. OF THESE, IN THIS ARTICLE, WE DISCUSS CASES OF EXTRAHEPATIC BILE DUCTS INJURIES PRODUCED DURING LAPAROSCOPIC CHOLECYSTECTOMY. WE EXCLUDED FROM THE STUDY THE LESIONS PRODUCED DURING CLASSICAL CHOLECYSTECTOMY OR OTHER SURGICAL INTERVENTIONS INVOLVING ADJACENT ORGANS. IN THE FOLLOWING, WE PRESENT THE CAUSE OF THESE LESIONS, THE MOMENT OF RECOGNITION AND OUR WAY OF SOLVING THESE LESIONS.*

*WE FOUND TWO LESIONS FROM A TYPE OF STRASBERG CLASSIFICATION, FIVE PUNCTUAL OR PARTIAL INJURIES (D TYPE OF STRASBERG CLASSIFICATION )OF THE EXTRAHEPATIC BILIARY DUCTS AND SIX MAJOR LESIONS ( E TYPE OF THE SAME CLASSIFICATION).*

*IN THE CASE OF MINOR LESIONS, EVEN IF THEY WERE RECOGNIZED POSTOPERATIVELY, LAPAROTOMY SHOULD BE AVOIDED AND ATTENTION SHOULD BE GIVEN TO CORRECT DIAGNOSIS OF THE TYPE OF LESION AND ITS LOCALIZATION*

*THE COMPLETE LESIONS OF THE MAIN BILE DUCT NECESSARILY REQUIRE AN OPEN INTERVENTION, AND THE PROCEDURES USED MAY BE: END-TO-END SUTURE, WHETHER OR NOT PROTECTED BY A TUTOR TUBE OR BILIO-DIGESTIVE DERIVATIONS IF THE MAIN BILE DUCT'S DIAMETER PERMITS US (IF IT IS DILATED). THE USE OF HEPATICOJEJUNOSTOMY ON ROUX-EN-Y LOOP REPRESENTS THE FAVORITE APPROACH IN THE RE-ESTABLISHING OF BILIARY CONTINUITY.*

**KEY-WORDS**: STRASBERG, ROUX-EN-Y HEPATICOJEJUNOSTOMY , EXTRAHEPATIC BILIARY DUCTS INJURIES, LAPROSCOPIC CHOLECYSTECTOMY, OPEN CHOLECYSTECTOMY

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## INTRODUCTION

Realized for the first time in1987, France, by Phillippe Mouret, laparoscopic cholecystectomy has quickly become the optimal therapeutical option in the case of gallbladder lithiasis because of his minimally invasive technique, reduced postoperative pain, faster recovery, shorter hospitalization, and as a whole, reduction of the hospitalization costs.(1,2) Despite its many advantages, this technique made itself remarcable through its high percentage of extrahepatic biliary ducts injures. In reference studies, their frequency varies between 0 and 2.7%, values significantly increased compared with those in classical cholecystectomy, which are assigned values of 0.2 - 0.5%.(3) The most common causes leading to extrahepatic bile duct lesions are: misperception resulting in an illusory model of the anatomy (when the surgeon cuts the common bile duct thinking it is the cystic duct), loss of haptic input, 2-dimensional video monitor view, fixed viewpoint, to much use of the electrocautery.(4,5)

Each biliary lesion occurred during laparoscopic cholecystectomy has distinct features, just like the surgeon's reaction when he recognizes it. (6)

## MATERIAL AND METHOD

Analyzing the 3595 cases of laparoscopic cholecystectomies performed in the 4$^{th}$ General Surgery Clinic in Craiova between 2001 and 2015, we focused on 13 cases of extrahepatic biliary ducts lesions. We did not include in the study those cases produced during the open cholecystectomy, as a fist choice. Six pacients were females and seven pacients were men. Mean age of the 13 pacients was 51.1, with age limits between 22 and 76 yeas.

This report includes only injuries and strictures ocurred in association with the laparoscopic cholecystectomy, irrespective of whether the operation was completed laparoscopically or converted to an open procedure. We divided the lesions into two categories: minor lesions according to Strasberg and Soper (A – 2 cases) and respectively major lesions comprising the classes D (5 cases) and E (6 cases) of the same classification. Thus major lesions included a punctual or partial section of the main bile duct in 6 cases (in one of those cases, a partial lesion became after the second surgical intervention a complete injury of the main duct bile ) and a complete section or obstruction of the common bile duct in 6 cases (including the one to which we have previously reffered).

## RESULTS

The conditions in which the injuries occurred were represented by: intense subhepatic adherence process involving supramesocolic viscera (duodenum, stomach, transverse colon) – 8 cases, important pediculitis process that prevented viewing / recognition main bile duct in most cases – 6 cases, the existence of scleroatrophic gallbladder located partially intrahepatic associated with pediculitis process – 1 case, subhepatic bleeding controlled by passing a transfixing wire – 1 case, more then one case involving two or three of this conditions. It is known that the acute and scleroatrophic forms of cholecystitis are risk factors because of the inflamatory proces and the fibrous resemblance they produce. There were two minor bile duct injuries, type A of Strasberg classification, detected in the early postoperative period, treatead conservatory.

We foccused on the major lesions produced in laparoscopic cholecystectomy. The lesion was recognized during the first intervention in 6 cases by the leak of bile appeared in the operator

field or discovering a "second cystic duct" which has led to the mistake we made confusing of the main bile duct with the cystic duct and clipping it. A thorough / discernible dissection highlighted the true cystic duct and the lesion was thus recognized. In other 5 cases the extrahepatic biliary ducts lesion was recognized in postoperative period, when pacients presented abdominal pain, nausea, vomiting associated with jaundice (3 cases), choleperitoneum or biliary leaks and the asthenic syndrome (2 cases).

We found five punctual or partial injuries of the extrahepatic biliary ducts which we will present below: one partial injury of the main biliary duct produced by the electrocautery whitch was resolved by a Kehr drainage; one partial section produced on the right hepatic duct resolved with a Kehr drainage whose long arm was inserted into the right hepatic duct; another lesion produced by the partial withdrawal of the cystic duct from the main biliary tract due to excessive traction has benefited from suture and patch. Two pacients presented punctual lesions of the common hepatic bile duct; one of those was resolved by a Kehr drainage of the CHBD, and the other one whose lesion was recognized postoperatively (bile leakage, cholangiography) has requested discharge, and presented in a surgical department specialized in solving the cases of biliary tract injuries.

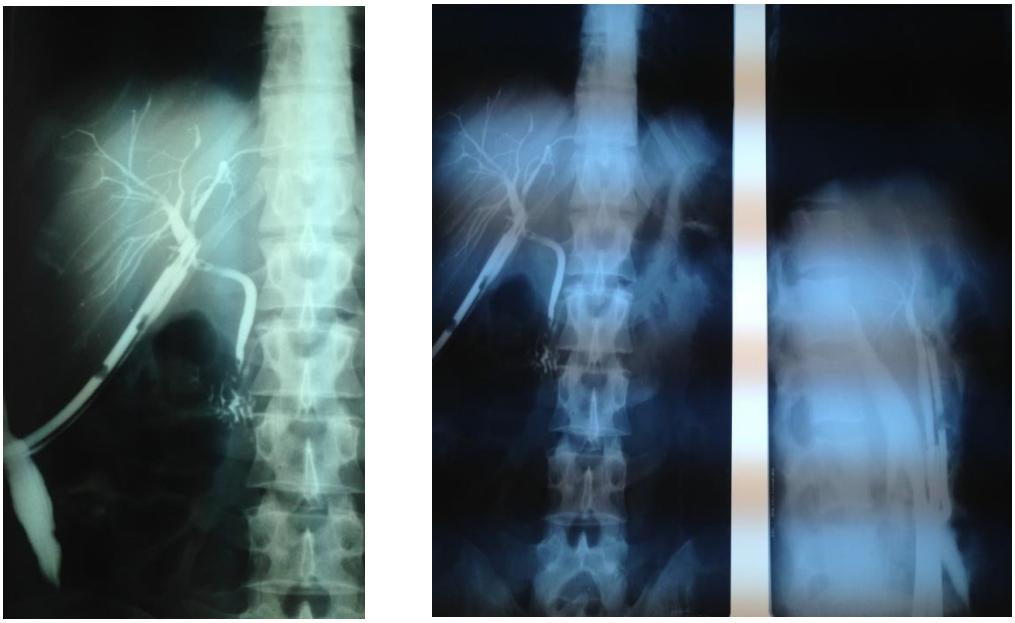

**Fig.1: Cholangiography of the pacient who requested discharge**

Regarding Strasberg E type lesions, we present: one case of laparoscopic cholecystectomy, apparently without any incident or accident described in protocol, whitch came back in our Clinic three weeks later with jaundice, abdominal pain, vomiting, discolored stools, dark urine. An ultrasound exam showed a sudden obstacle to the main bile duct and dilation upstream of it. Surgery occured and the fully cliped common bile duct is discovered. It was practiced a Roux-en-Y loop hepaticojejunostomy. The second case, a complete section of the main bile duct confused

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with the cystic duct, was recognized intraoperative and it has been repaired through a Roux-en-Y choledocojejunostomy. The third case, another complet section al the common bile duct has been resolved through a end-to-end choledococholedocoanastomosis carried out by a transanastomotic drainage. The fourth case came back in our Clinic with obstructive jaundice appeared a week after a laparoscopic cholecystectomy whose protocol did not show any difficulties. Again, ultrasound highlights the presence of the clip on the main biliary duct. Surgery occured and a Roux-en-Y hepaticojejunostomy was practiced. The fifth case, a difficult laparoscopic cholecystectomy with bleeding even difficult to control, converted into open surgery for hemostasis, presented postoperatively significantly increased bile leakage, and the last cholangiography finally showed dilatation of the common hepatic duct, with a sudden interruption of the choledoc. Roux-en-Y hepaticojejunostomy was practiced in this case, too.

**Fig. 2: Cholangiography of the fifth pacient with common hepatic bile duct injury**

The last case, an elderly pacient, presented one week later after the laparoscopic cholecystectomy with general condition alteration, fever, diffuse abdominal pain; ultrasound showed a large amount of intraabdominal fluid and paracentesis established the diagnosis of choleperitoneum. Is intervened surgically in the open manner, and a punctual lesion of the common hepatic duct is found which is solved by a Kehr drainage. The pacient is discharged with the Kehr drainage and came back five weeks later with jaundice. Surgery occurs this time too and a biliary common duct stenosis is found. The surgeon practiced a Roux-en-Y hepaticojejunostomy carried out by a transanastomotic drainage.

Immediate complications were specific (minor anastomotic fistula:20-30 ml flow under conservative treatment between 5-7 days-2 cases and biliragia 1 case in a patient who had his main duct bile drained with Kehr tube, resolved spontaneously within 4 days - source could not be identified: hepatic or bilirubin at the CBP suture around Kehr) and nonspecific: wound infection 2

cases, wound hematoma 2 cases, acute pneumopathy 1 case, urinary infection 3 cases. Late Complications – common bile duct stenosis 1 case. All patients were discharged from the hospital 7-10 days after the intervention.

**DISCUSSION**

The iatrogenic extrahepatic biliary ducts lesion is a serious fatal accident. If only some surgeons perceive it as a "catastrophic event for the patient," everyone agrees that the best treatment is prevention. An accidental surgical lesion of the bile duct represents one of the most exciting challenges even for an expert surgeon; the higher the lesion, the greater is the skill and experience required. The most suitable reconstructive technique and the timing of surgery are often determining factors for obtaining good long-term results (7). The real incidence of this lesions is not fully known because not all the pacients return to the same surgeon or could be under-reported. Only one quarter of bile duct injuries are recognized during surgery (8).

The most common circumstances of extrahepatic bile duct lesions are represented by: acute and scleroatrophic forms of cholecystitis due to the inflammatory changes they produce, subhepatic adhesions, unrecognized anatomical abnormalities, bleeding and attempt to control it through various methods, incorrect identification of ducto-vascular elements or the wrong interpretation of these, the surgeon's experience (12). Diathermy has been identified as a cause of iatrogenic injury. The main cause of biliary lesions is an incorrect identification of the anatomy of the Calot triangle. As a first gesture, it’s important to identify each element. We think like many other surgeons that the gallbladder's anterograde approach can better and accurately highlight the pedicle's vasculobiliary elements and thus decreases the risk of damage to these items.

The results of repair surgery for extrahepatic biliary tract lesions are influenced by several factors: the moment of recognition, the time of repair, the location of the lesion, the type of lesion, the association of other injuries and of course the surgeon's experience (11). A delicate problem, perhaps even more important than solving the lesions, is their intraoperative recognition. It is generally accepted that the best long-term results are provided by surgical repair of injuries recognized immediately after their production. Intraoperative cholangiography should be performed to determine the exact location and extent of the lesion (13).

In the case of minor lesions, even if they were recognized postoperatively, laparotomy should be avoided and attention should be given to correct diagnosis of the type of lesion and its localization. ERCP plays an important role and can become both the diagnostic method and the therapeutic way by performing papillosphincterotomy to improve bile discharge in the duodenum (9,10). In major bile ducts injuries, the main treatment is surgery which must provide adequate biliary drainage in the digestive tract. To obtain favorable long term results, it is important that reparatory surgical interventions be carried out in centers specialized in hepatico-biliary surgery. Each millimeter of healthy bile duct shall be preserved (14). The ways of repairing the lesions are reconstructive, substitutive or derivative, in relation to the location and extent of the lesion. In the case of incomplete lateral sections of the extrahepatic bile ducts, the suture of the orifice associated (or unlikely to be) with transcystic or choledocian drainage can be fixed (15,16,17).

The complete lesions of the main bile duct necessarily require an open intervention, and the procedures used may be: end-to-end suture, whether or not protected by a tutor tube or bilio-digestive derivations if the main bile duct’s diameter permits us (if it is dilated). Otherwise, repair can be done after obtaining a proper caliber of the biliary partner (18). The use of

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hepaticojejunostomy on Roux-en-Y loop represents the favorite approach in the re-establishing of biliary continuity, associated with a success rate of 92% as opposed to other therapeutic modalities (end-to-end anastomosis protected with a Kehr tube, dilatation with balloon). Hepp-Couinaud anastomosis represents a safe, durable anastomosis and a final solution for biliary lesions with previously multiples reparatory interventions (14).

**CONCLUSIONS**

Despite its many advantages, laparoscopic cholecystectomy continues to "provide" the most cases of extrahepatic bile duct lesions, the incidence of which persists for many years. The yearly distribution of the studied cases did not show a decrease in the number of these injuries with the accumulation of experience by the surgeons. The causes and circumstances in which these lesions occurred, did not differ from those cited in the literature.

In the case of minor lesions, even if they were recognized postoperatively, laparotomy should be avoided and attention should be given to correct diagnosis of the type of lesion and its localization. In major bile ducts injuries, the main treatment is surgery which must provide adequate biliary drainage in the digestive tract. To obtain favorable long term results, it is important that reparatory surgical interventions be carried out in centers specialized in hepatico-biliary surgery.

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