Results of surgical treatment of 103 patients with intraoperative magistral bile ducts injuries were observed. Roux-en-Y hepaticojejunostomy was the main operation in complete extrahepatic bile ducts (EHBD) transaction and excision; it was performed in 64 patients with following good remote results (95.3%). Restorative operation was indicated only in partial injury of the duct. Formation of bile-biliary anastomosis (BBA) in complete transaction of the duct in all cases resulted in stricture. Hepaticoduodenostomy also led to negative treatment results. Complications in the near postoperative period made 22.3% and in the remote one -35.9%. Repeated operative interventions were performed in 32.3% of patients, lethal outcome made 5.8%.

Keywords: Magistral bile ducts, surgical treatment, Roux-en-Y hepaticojejunostomy

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Introduction

In the past two decades in Uzbekistan, as well as in many countries of the world, increase in number of patients with bile-excreting tract diseases is observed. Thus, every year about 700,000 operations for cholecystectomy (CH) are performed in the USA, more than 100,000 in Russia, and about 10,000 CH in Uzbekistan (Bismuth and Majno, 2001; Galperin and Chevokin, 2010; Nazirov et al., 2010).

Together with this, 2-4 times increase in frequency of bile duct injuries is noted that makes from 0.22 to 1.86% (Strasberg et al., 1995; Chernishov et al., 2004; Misra et al., 2004; Nazirov and Gaziev, 2005; Nechay and Novikov, 2006; Beburishvily et al., 2009; Galperin and Chevokin, 2009; Nazirov et al., 2010). The authors studying this problem, notice that introduction of laparoscopic cholecystectomy resulted in marked increase of frequency and severity of bile ducts injuries. If the average rate of magistral bile ducts traumas makes 0.5 -1%, from 50 to 100 people suffer from such complications in Uzbekistan.

In bile ducts traumas, treatment is particularly complicated, requiring long period, expensive therapeutic diagnostic manipulations, resulting in severe disability of patients. Lethal outcome makes 8-17%, complications in operations make almost 47%, development of bile duct posttraumatic strictures to 35-55% (Schiano Di Visconte, 2002; Galperin, 2003; Way et al., 2003; Maystrenko et al., 2005; Artemyeva and Kohanenko, 2006; Shapovalyants et al., 2006; Timerbulatov et al., 2010).

Time of revealing of extrahepatic bile duct (EHBD) injuries is very important for successful treatment. Distinction is made between “fresh” intraoperative injuries and posttraumatic cicatrical strictures in bile ducts and biliodigestive ducts. Intraoperative injuries in their turn are divided into detected/diagnosed on the operating table and revealed in early postoperative period.

Findings of investigations, including those in Uzbekistan, show that only in 30% of observations iatrogenic injuries of bile ducts are diagnosed during the operation, about 50% of injuries are diagnosed in the postoperative period on the background of peritonitis development, rapidly developing mechanic jaundice or bile excreting along the drainage. More than 15% of patients die from progressing peritonitis, augmentation of jaundice or other undiagnosed in a due time postoperative complications.
The analysis of frequency and causes of unfavorable results of operative interventions in bile excreting tracts is particularly urgent for public health of Uzbekistan. It is very important for practical surgeon to develop the algorithm of activities in intraoperative injuries of bile ducts.

Therefore, the purpose of our study is focused on improvement of surgical treatment of intraoperative magistral bile ducts (MBD) injuries.

**Material of investigation**

The results of surgical treatment of 103 patients with intraoperative MBD injuries during the period of 2000-2010 were observed. According to our findings MBD injuries were noted in 38 (0.58%) patients for 6521 cases of ChE: of them 27 patients were after LChE, 6 - after minilaparotomic ChE (MLChE), 5 - after traditional ChE (TChE).

65 patient were admitted from the other inpatient departments with intraoperative MBD injuries, of them 12 - after LChE, 52 - TChE and 1 - MLChE.

In 28 (27.2%) patients MBD injuries were revealed intraoperatively, in most of them -75 (72.8%) patients - the injuries were revealed in early postoperative period. There were 81 operated females (78.6%) and 22 males (21.4%). The age of the patients was 19-80 years.

Evaluation of injuries was carried out according to Galperin classification (2009); it is shown in Table 1. Marginal partial injury of bile ducts was revealed in 11 patients, clipping and ligating of the duct without its transaction and excision of bile ducts - in 47, excision of the duct and ligating of its proximal stump - in 31 patients. In 24 patients the injury was revealed at “+2” level, in 38 -“+1”, in 18 -“0”, in 13 -“-1”, in 10 -“-2”. In 22 patients admitted from the other inpatient departments the character and the level of the injury was only revealed after performing laparotomy, as far as medical documentation did not include necessary information. In early postoperative period MBD injuries in 34 patients were manifested by augmentation of mechanic jaundice and in 20 - by bile peritonitis, in 10 - by profuse bile excreting along the drainage from the abdominal cavity, and in 11 patients - by two or more complications.

<table>
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<th>TABLE 1. CHARACTER AND LOCALIZATION OF MBD INJURIES (n=103)</th>
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<td>Marginal injury</td>
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Results

In *intraoperative revealing of bile ducts injuries* of 28 patients, 18 patients had complete duct transaction, 10 - marginal injury. In 25 patients the operations for rehabilitation of bile ducts anatomy were performed at once and in 3 patients during two stages.

In transaction and excision of the duct the hepatico-jejunal anastomosis (HepJA) according to Roux was performed in 5 patients, of them in 3 patients on transhepatic carcass drainage (THCD) and in 2 without carcass drainage.

In intrahepatic MBD injuries with confluence disturbance (4 patients) in one case the bi-hepatico-jejunal anastomosis (BiHepJA) according to Roux is performed on THCD immediately after revealing the duct trauma. Drainage of hepatic ducts was performed in 3 patients at the first stage due to their narrow diameter, in 3 months the BiHepJA according to Roux on THCD was performed. In these patient anastomosis stricture developed in 18 months after elimination of carcass drainage, which was removed by antegrade bougienage.

Hepaticoduodenanastomosis (HepDA) was applied to 2 patients. In these patients cholangitis and anastomosis stenosis were observed in the follow-up period. One patient underwent the course of balloon dilatation and diatermodilatation; and HepJA was applied to the second patient (in the postoperative period he was found with developed hemobilia, controlled by conservative treatment).

Biliobiliary anastomosis (BBA) was applied to 7 patients with intersection of the common bile duct (CBD). All of them faced to developed duct stricture and needed the repeated intervention. HepJA was performed in 5 patients (4 on THCD and one without carcass drainage). HepDA was applied to one patient with satisfactory follow-up result (according to anamnesis this female patient underwent resection of the stomach on Bilrot-II). One patient underwent endoscopic stenting of the duct.

In marginal partial injury of the hepaticocholedochus (HCh) the injured wall was sutured in 10 patients (prolen 5/0) on Kehr’s drainage. The results of treatment were satisfactory.

In *revealing bile ducts injuries in early postoperative period* (n=75) one or two stages interventions were performed, depending on presence of infiltrative inflammatory changes in subhepatic area.

34 patients with mechanic jaundice without inflammatory infiltrative process underwent single stage operative intervention.

Of 14 patients with clipping or bandaging of the bile duct without its transaction 12 patients underwent removal of ligature or clip with external drainage of the bile duct. Satisfactory follow-up result is observed in 7 of them. In 5 patients duct stricture developed and reconstructive operations according to Roux were performed. BBA was applied to 2 patients after removal of ligature. In a year they faced with developed duct stricture and endoscopic stenting with satisfactory follow-up result of treatment.

Of 20 patients with HCh excision and bandaging of proximal duct stump, reconstructive operations were performed in 8 patients; HepJA according to Roux on THCD in 4 patients, HepJA without carcass drainage was applied to 2 patients. Satisfactory result was noted in 5 patients; in one case (after HepJA without carcass drainage) there was bile excreting along the control drainage, which stopped itself on the 15th day after the operation. Transcutaneous transhepatic cholangiostoma was applied to 2 patients with hepatic insufficiency at the first stage and HepJA according to Roux on THCD according to Pradery-Smith at the second stage. Of these patients in 1 patient anastomosis stricture developed in a year after carcass drainage removal.

HepDA was applied to 2 patients with anastomosis stenosis and in one case repeated reconstructive operation was performed (HepJA without carcass drainage was applied), in the second case endoscopic dissection of stricture.
BBA was performed in 10 patients, 8 of them needed repeated operative interventions due to the duct stricture (HepJA was applied to 5 patients, HepDA to 3 patients).

Of 20 patients with peritonitis with marked infiltrative changes in the subhepatic area in 12 patients (with HCh dissection) external drainage of proximal duct stump was performed at the first stage, of them 2 patients died from severe neglected peritonitis. HepJA was applied to 7 patients at the second stage. Of them in 1 patient the biloma drainage was performed in the postoperative period under US control. After carcass drainage removal this patient was under our observation and anastomosis stricture did not develop. HepDA was applied to 3 patients and all of them faced with the developed recurrent cholangitis and anastomosis stenosis; therefore, repeated endoscopic balloon dilatations and diathermodilatations were performed. 3 patients were admitted from the other inpatient departments after external drainage of the duct proximal stump: HepJA was applied to 2 of them. One patient refused from the second stage of the operation.

5 patients were admitted from the other inpatient departments after rehabilitation reconstructive operations with insolvent sutures and peritonitis (1 patient after HepJA and 4 after BBA). Two-stage operative interventions and high HepJA were applied in 4 patients. One patient died due to neglected peritonitis.

In early postoperative period MBD injuries in 11 patients resulted in peritonitis and mechanic jaundice. These patients underwent two-stage operative interventions. The first stage of external drainage of the duct proximal stump was performed in all 11 patients (of them 3 patients were operated in other inpatient departments). The second stage of the operation was performed in 2-3 months after remission of inflammatory infiltrative process of subhepatic area. HepJA was applied to 9 patients (7 on THCD, 2 - without carcass drainage). Satisfactory result is noted in 8 cases, in 1 case bile excreting along the control drainage was observed, which stopped itself on the 11th day after the operation. HepDA was applied to 2 patients, of them 1 patient died from cardiac insufficiency.

Of 10 patients with profuse bile excreting from the abdominal cavity in 1 female patient in the repeated operation, marginal injury of the bile duct was revealed and suturing of the defect on Kehr drainage was performed. In HCh excision at the first stage external drainage of the duct proximal stump was applied and HepJA at the second stage. 1 patient was admitted after external drainage of the duct proximal stump, HepJA according to Roux on THCD was applied to her, 2 patients were admitted with BBA insolvent sutures performed in other inpatient departments. These patients also underwent repeated two-stage operative interventions with HepJA application in the first and HepDA in the second observations. In 2 patients with bile excreting from the abdominal cavity without marked infiltrative process in the portal area of liver, HepJA according to Roux was applied by single stage.

Complications in the near postoperative period were observed in 23 (22.3%) patients, of them in 6 (5.8%) with lethal outcome. In the follow-up period unfavorable result was observed in 37 (35.9%) patients: including 3 (4.7%) patients with HepJA stenosis, 12 (85.7%) with HepDA stenosis, 17 (89.5%) with BBA. 33 (32.03%) patients needed repeated operative interventions.

**Discussion**

In recent years the number of performed operations for cholecystectomy has significantly increased and most of them are performed by means of laparoscopic method (more than 80% according to our findings). MBD injuries have considerably increased after introduction of laparoscopic cholecystectomy, particularly at the period of mastering the use of this method. These injuries are of special severity as far as in addition to high bifurcated mechanical trauma there is marked thermic effect on the duct wall.

The best results were achieved in the group of patients where the operations were performed in introoperative revealing of MBD traumas. Of 28 patients good nearest and
follow-up results of treatment were received in 84.3% of patients. However, MBD injuries (according to our findings) were revealed intraoperatively only in 27.2% of patients.

In most patients bile ducts injuries are diagnosed lately (in 72.8% according to our findings) after development of peritonitis or mechanical jaundice. So, in most patients external drainage of bile ducts is performed instead of bile outflow normalization immediately after getting trauma.

In revealing MBD injuries in the nearest postoperative period on the background of peritonitis, subhepatic abscess, bile excreting, it is reasonable to perform only external drainage of the bile tracts. It is desirable to perform reconstructive operation after remission of inflammatory infiltrative process in 2-3 months as a second stage of treatment. This tactics proved to be correct in 30 (73.1%) patients of this group.

In 7 (17.1%) patients rehabilitation reconstructive operations on the background of peritonitis resulted in insolvency of anastomosis sutures.

The main operation in complete MBD transaction and excision is HepJA according to Roux that was only performed in 64 patients with good follow-up result in 95.3%. HepJA without carcass drainage shortens considerably the terms of patient’s treatment; however, this method (Hepp-Couinaud procedure) was only performed in 11 patients of this group. The main feature of this operation is isolation of the left hepatic duct in the place of its confluence with the right duct under the portal lamina. It gives opportunity to isolate the ducts out of cicatricial tissues and to apply anastomosis 2-3 sm wide, mainly on the account of the left hepatic duct, escaping burdensome, long (1.5-2 years) drainage of anastomosis area.

Rehabilitative operation is only indicated in partial marginal duct injury. In 11 patients of this group suturing of the duct defect on Kehr’s drainage had satisfactory result. In the duct injury, unlike its complete intersection, receiving of good results takes place as preservation of narrow posterior duct wall provides its sufficient blood supply.

BBA formation in transaction and excision in all 19 observations was completed by development of cicatricial stricture. Of them 16 patients underwent reconstructive operations, 3 - endoscopic stenting. Some experience in endobiliary stenting permits us to estimate positively this method. Performance of operations for formation of anastomosis of the injured duct and duodenum had unfavourable results. These patients had chronic cholangitis and biliodigestive anastomosis that required repeated reconstructive operations in 2 and endoscopic interventions in 9 patients.

**Conclusion**

The cause of failure in treatment of intraoperative MBD injuries are unpunctual diagnosis and performance of inadequate in volume operations directed to restoration of bile outflow by formation of biliobiliary and bilioduodenal anastomoses. These kinds of operations should be performed by high professional surgeons who have experience in reconstruction surgery.

**References**


