Research Article

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Laparoscopic Treatment of Mirizzi Syndrome

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BACKGROUND Mirizzi syndrome (MS) is a relatively rare complication of cholelithiasis, which occurs in a wide range from 0.2 to 5% according to different authors. Today, the surgical treatment of MS remains a challenge.

AIM OF STUDY To determine the possibilities of laparoscopic interventions in the surgical correction of various types of MS.

MATERIAL AND METHODS The work is based on a prospective analysis of cases of laparoscopic treatment of 19 patients with MS who were treated in the emergency surgery departments of the Republican Scientific Center for Emergency Medical Care in 2017–2019. This is 22.9% of all admitted patients (83) with MS during this period. Type 1 MS was diagnosed in 3 patients (15.7%), type 2 was diagnosed in 16 patients (84.2%).

RESULTS In all cases of type 1 MS, laparoscopic cholecystectomy was performed. A new method for the correction of type 2 MS by forming a sleeve from the gallbladder wall was suggested, which was performed in 10 patients with good results. In the postoperative period, no nonspecific complications were observed in patients undergoing laparoscopic interventions. One patient had residual choledocholithiasis, which was managed by day 5 after the surgery with endoscopic retrograde cholangiopancreatography and endoscopic papillosphincterotomy and the removal of the calculus from the common bile duct. The average duration of stay of patients in a hospital bed was 10.8 days. Fatal outcome was observed in 1 case (5.3%).

CONCLUSION 1. The inclusion of endoscopic retrograde cholangiopancreatography, percutaneous transhepatic cholangiography and magnetic resonance imaging cholangiography in the diagnostic scheme improves the accuracy and quality of recognition of Mirizzi syndrome and allows the indications for the use of video laparoscopy to be evaluated. 2. Indication for laparocopic treatment of type 2 Mirizzi syndrome is the presence of a single calculus in the supraduodenal part of the common bile duct, which makes it possible to reduce the number of conversion to laparotomy. 3. In cases of type 1 Mirizzi syndrome, the operation of choice is laparoscopic cholecystectomy. 4. The operation of choice in patients with type 2 Mirizzi syndrome is laparoscopic subtotal cholecystectomy, fistula plasty with a gallbladder flap on the Kehr's T-tube drain with the formation of a "cystic duct"-type sleeve.

Keywords: cholecystobiliary fistula, Mirizzi syndrome, obstructive jaundice, choledocholithiasis

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EPST – endoscopic papillosphincterotomy

ERCPG – endoscopic retrograde cholangiopancreatography

IHPD – intrahepatic bile ducts

MJ – mechanical jaundice

MRCPGG – magnetic resonance cholangiopancreatography

MRI – magnetic resonance imaging

MRI cholangiography – magnetic resonance imaging cholangiography

MS – Mirizzi's syndrome

PC – purulent cholangitis

PCTHCG – percutaneous transhepatic cholangiography

BACKGROUND

Mirizzi syndrome (MS) is a relatively rare complication of cholelithiasis, which, according to different authors, occurs in a wide range - from 0.2 to 5%. Today, the surgical treatment of MS remains a challenge [1–4].

Since the introduction of laparoscopy for cholecystectomy in the 1980s, laparoscopic cholecystectomy has become the procedure of choice in the treatment of cholelithiasis [5]. Over the past two decades, with the technological improvement of laparoscopic equipment, both in the imaging system and special instruments, as well as the development of new technical solutions for performing laparoscopic interventions, progress has been made in the application of minimally invasive surgery in more complex situations, such as acute cholecystitis, gallbladder empyema and choledocholithiasis [6, 7].

However, despite what has been achieved, laparoscopic correction in MS, especially in its type 2, remains a very technically complex procedure [8]. According to different authors, the conversion rate to laparotomy in MS reaches 40% [9, 10]. According to *R.R. Ronald* and *Re de MoRicz* [11], the transition to conversion after laparoscopy in type 2 MS reaches 100% of cases. G.M. Askerkhanov et al. [12] believe that the detection of a "wrinkled" gallbladder is a contraindication for performing laparoscopic cholecystectomy.

According to T.I. Tamm et al. in 11 cases out of 12 with type 1 MS, laparoscopic cholecystectomy was performed, of which, in 3 cases, due to the presence of dense cicatricial adhesions in the hepaticocholedochus area, it was the reason for the transition to an open method of intervention. Of the 15 patients with type 2 MS, 12 patients were operated on. Of these, only 1 case underwent laparoscopic intervention.

The introduction of ultrasound, magnetic resonance imaging (MRI), as well as percutaneous transhepatic cholangiography (PTHCG) and endoscopic retrograde cholangiopancreatography (ERCPG) into clinical practice has significantly improved the diagnosis and recognition of MS [13–16].

In modern literature, there is an increase in the number of publications in which the authors provide data on the possibility of surgical correction of this pathology using laparoscopy [17, 18].

However, these studies are based on a small number of observations, which does not allow the authors to draw general conclusions, firstly, on the feasibility of such operations, and secondly, on a clear definition of the place of laparoscopic interventions in the arsenal of MS treatment methods.

In this regard, the **aim** of this study was to determine the possibilities of laparoscopic interventions in the surgical correction of various types of MS.

MATERIAL AND METHODS

The work is based on a prospective analysis of cases of laparoscopic treatment of 19 patients with MS who were in the emergency surgery departments of the Republican Scientific Center for Emergency Medical Care from 2017 to 2019. This is 22.9% of all admitted patients (83) with MS during this period. Type 1 MS was revealed in 3 patients (15.7%), type 2 — in 16 (84.2%). Of these, there were 10 women (52.6%), and 9 men (47.4%). The age of patients ranged from 25 to 84 years and averaged 53.7 years. It should be noted that with the accumulation of experience and specification of indications for the laparoscopic method, the number and proportion of laparoscopic interventions progressively increased from annually (Table 1).

Table 1

Types of surgical interventions for Mirizzi syndrome types 1 and 2

Operations	2017		2018		2019		Total, abs. (%)	
	1st type	2nd type	1st type	2nd type	1st type	2nd type	1st type	2nd type
Traditional, abs. (%)	1 (1.2)	26 (31.3)	2 (2.4)	20 (24.1)	–	15 (18.1)	3 (3.6)	61 (73.5)
Lapaparoscopic, abs. (%)	–	2 (2.4)	1 (1.2)	5 (6)	2 (2.4)	9 (10.8)	3 (3.6)	16 (19.3)

Upon admission to the clinic, all patients were examined according to the medical and diagnostic standards of the emergency medical service of the Republic of Uzbekistan.

At the same time, the main task of clinical and laboratory examination methods was to conduct an objective assessment of the general condition of patients with the determination of the degree of intoxication, the identification of concomitant diseases that should be corrected, if possible, and the establishment of operational and anesthetic risk.

To establish the presence of MS with the identification of its anatomical features, we used an ultrasound examination and special instrumental methods: magnetic resonance cholangiopancreatography (MRCPG), endoscopic retrograde cholangiopancreatography (ERCPG), and percutaneous transhepatic cholangiography (PCTHCG). Among them, MRCPG proved to be the most optimal in the diagnosis of MS due to its non-invasiveness and high accuracy (Fig. 1, 2).

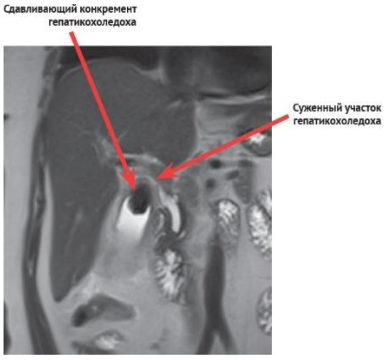

Fig. 1. Magnetic resonance cholangiopancreatographic signs of Mirizzi syndrome type 1

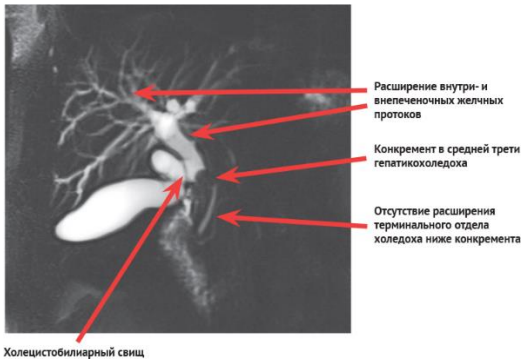

Fig. 2. Magnetic resonance cholangiopancreatographic signs Mirizzi syndrome type 2

RESULTS

Ultrasound examinations were performed in all patients, while in 19 patients (100%) with MS, regardless of its type, dilatation of the common hepatic duct was detected. The diameter of the common hepatic duct averaged 9.1±2.6 mm, while the choledochus distal to gallbladder was not visualized. In addition, ultrasound revealed the following signs of MS:

- dilatation of intrahepatic ducts (90.0%);
- acute calculous cholecystitis (26.3%);
- calculi in the common bile duct (47.1%);
- a fixed calculus in the neck of the gallbladder (15.8%);
- shrunken or shortened gallbladder (73.7%).

Upon admission, all examined patients had phenomena of obstructive jaundice (MJ) with bilirubinemia from 24.4 to 367.3 μmol/l. Four patients (19%) had a clinic of purulent cholangitis (PC).

The manifestations of MJ in the examined patients dictated the need for treatment of patients with MS in two stages. At the first stage, ERCPG revealed the following signs in 2 patients with MS type 1 (Fig. 3):

- narrowing of the lumen of hepaticocholedochus at the level of the location of the gallbladder;
- suprastenotic dilatation of the bile ducts;
- smooth internal contours throughout the narrowing of the duct;
- the presence of a filling defect presenting to the narrowing area;
- lack of contrasting of the gallbladder.

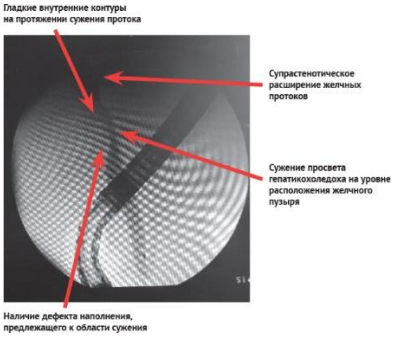

Fig. 3. Endoscopic retrograde cholangiopancreatography for Mirizzi syndrome type 1

In 1 case with MS type 1, surgery was performed without ERCPG.

All patients with type 1 MS underwent laparoscopic cholecystectomy. In 1 case, laparoscopic drainage of the choledoch according to Pikovsky was additionally performed due to the presence of PC.

In type 2 MS, at the first stage in 10 patients (62.5%) we started with an attempt to perform endoscopic surgical interventions in the form of ERCPG and endoscopic papillosphincterotomy (EPST). At the same time, endoscopic lithoextraction was not successful in any case due to a discrepancy between the size of the calculus and the terminal portion of the choledochus. ERCPG revealed the following radiological signs of type 2 MS (Fig. 4):

- location of the blocking calculus in the middle third of the hepatocholedochus (94.3%);
- no dilatation of the terminal parts of the choledochus (86.2%);
- shrunken gallbladder (54.3);
- no shadow of the cystic duct with contrasted gallbladder (24.3%);
- “failure” of a retrogradely inserted catheter in the gallbladder (21.2%).

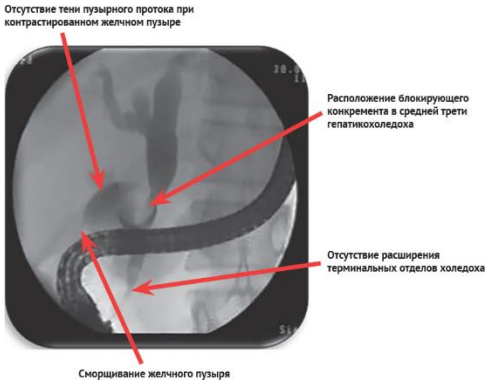

Fig. 4. Endoscopic retrograde cholangiopancreatography for Mirizzi syndrome type 2

In this regard, endoscopic drainage interventions were successfully performed in only 4 examined patients (40%). At the same time, we performed EPST with choledochal stenting in 3 (30%) of them, and nasobiliary drainage in 1 case (10%). In 3 patients (18.7%), decompression of the bile ducts was achieved by applying PCTHCS.

All patients with Mirizzi syndrome type 2 underwent laparoscopic interventions at the second stage. Moreover, in 9 patients (56.3%), these operations were performed on an emergency basis, and in 7 patients (43.7%) after decompression, they were performed on a delayed basis.

During laparoscopic operations, we performed intraoperative cholangiography in 4 patients (25%), and intraoperative choledochoscopy in 12 (75%) patients. These studies served us as a criterion for the completeness of lithoextraction and adequate sanitation of the choledochus during laparoscopy.

It should be noted that in 1 of the patients (6.2%), intraoperative cholangiography revealed the presence of a low-lying calculus in the retroduodenal part of the common choledochus, which greatly hampered its laparoscopic removal. This was the reason for the conversion to traditional laparotomy and lithoextraction with this particular access.

All the remaining 15 patients (93.8%) were able to complete the operation laparoscopically. At the same time, in all these patients, laparoscopic subtotal cholecystectomy was first performed with the preservation of a part of the posterior wall of the gallbladder and the formation of a flap from it to close the existing vesicocholedochal fistula.

The further course of the operation depended on the size of the calculi in the choledochus and the possibility of their removal through the formed vesicocholedochal fistula.

In 10 cases (62.5%), choledocholithoextraction was performed through the existing fistula, then the choledochus was drained with Kera's drainage through the same fistula with plasty and the formation of a kind of "cystic duct" around the drainage from the left flap of the gallbladder wall.

In 5 cases (31.3%), due to the large size of the choledochal calculi, it was not possible to perform choledocholithoextraction through the formed defect of the vesicocholedochal fistula. Therefore, in these patients, we performed choledochotomy over the calculus in the transverse direction with removal of the calculus and drainage of the choledochus according to Kehr through the choledochal incision, with plasty of the defect in the wall of the hepaticocholedochus with a flap of the gallbladder wall.

In the postoperative period, no nonspecific complications were observed in patients undergoing laparoscopic interventions. One patient had a specific complication in the form of residual choledocholithiasis, which was corrected on the 5th day after the operation by performing ERCPG with EPST and removal of their choledochal calculus.

The average length of stay of patients in a hospital bed was 10.8 days. Fatal outcome was observed in 1 case (5.3%). The cause of death was the development of severe sepsis due to the formation of multiple cholangiogenic hepatic abscesses in the patient.

DISCUSSION

Most authors rightly classify surgical interventions in MS as one of the most difficult in biliary tract surgery. This is associated with the fact that during such operations, due to the existing severe morphological changes, a serious danger of possible damage to the main bile ducts is created. Attempts to eliminate these injuries are fraught with the development of postoperative stricture of hepaticocholedochus, requiring further complex reconstructive surgical interventions [19–22].

In the modern literature on the issues of bile duct surgery, there are reports of the possibility of successful laparoscopic treatment of MS. Although in fairness it should be noted that these reports contain isolated clinical cases, but their number increases over time.

In this regard, we considered it appropriate to publish this report, which presents the experience of laparoscopic treatment of 19 patients with MS.

The analysis of the obtained results clearly indicates a certain exaggeration of the literature data on the existing insurmountable obstacles and the allegedly fatal inevitability of the occurrence of intraoperative complications with a large number of conversions to laparotomy during these interventions.

Of the 19 laparoscopic interventions performed, no intraoperative technical complications were noted in any observation. In just one patient, the conversion of access during laparoscopic surgery to traditional laparotomy was noted. Only one patient had a postoperative specific complication, which was successfully eliminated.

The results of laparoscopic operations for MS that we have obtained convincingly indicate that with the availability of modern endovisual equipment and specially trained qualified specialists, there are all opportunities for quite successful application of these interventions in the treatment of this pathology.

A good example of the above data is the following clinical observation:

A 34-year-old male patient I., case history No. 62790, was admitted to the clinic with complaints of pain in the right subcostal area and epigastrium, yellowish skin and sclera, dark urine, discoloration of feces, weakness.

According to the patient, he has been suffering from choledocholithiasis for 2 years, when he noted episodes of pain in the right subcostal area. He was treated permanently, the attack was managed conservatively, then he refrained from the proposed operation. This attack of MJ is the first ever. Five days before admission to the clinic noted the appearance of the above complaints.

The general condition of the patient at the time of admission of moderate severity. Skin and visible mucous membranes are icteric. In the lungs, vesicular breathing on both sides. Heart sounds are muffled, pulse is 88 bpm, rhythmic, arterial pressure is 130/80 mm Hg. The tongue is dry, covered with a yellow coating. The abdomen is soft, on palpation there is pain in the right subcostal area. The gallbladder is not palpable. Shchetkin-Blumberg's symptom is negative. There are no dullness in the sloping places of the abdomen on percussion. Intestinal peristalsis is auscultated. The stool is discolored, urination is not impaired, the urine is dark.

Ultrasound of the abdominal cavity shows the gallbladder measuring 11.4x3.9 cm, the wall is 0.4 cm, and the stone is not clearly visualized in the cavity. The choledochus is dilated - 1.6 cm, the intrahepatic bile ducts (IHBD) are dilated - 0.7 cm (Fig. 5).

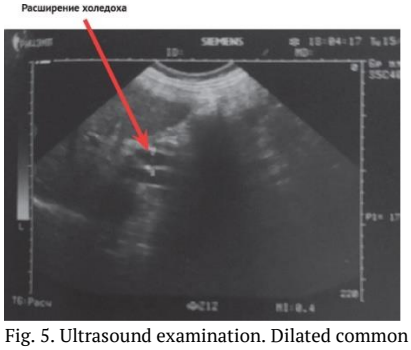

Fig. 5. Ultrasound examination. Dilated common bile duct

Blood tests: hemoglobin - 133 g/l, RBC - 4.6 million, hematocrit - 44%, WBC - 6.8 thousand, bilirubin total. - 141.0, direct - 61.8, diastasis - 20.4, alanine aminotransferase - 408.0, aspartate aminotransferase - 393.0, prothrombin index - 106%.

Magnetic resonance tomocholangiography was performed, on which the gallbladder was 9.7x3.0 cm in size, with bends in the neck. The cystic duct is dilated up to 1 cm. In the middle third of the choledochus, a calculus is determined with dimensions of 1.0x1.4 cm. The calculus is above the calculus 26 mm, below 7 mm. IHBD 8 mm (Fig. 6).

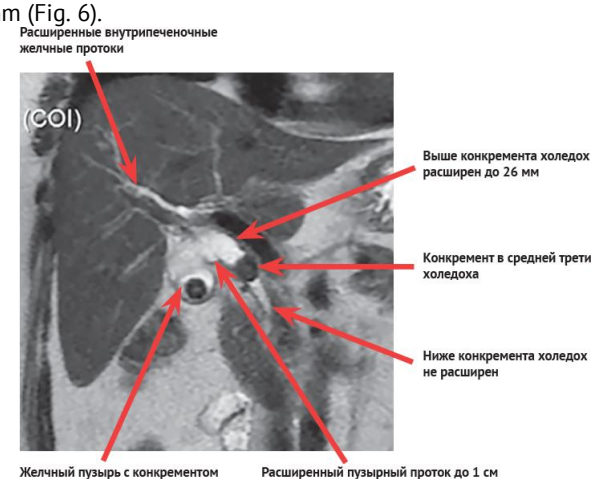

Fig. 6. Magnetic resonance tomocholangiography. The calculus in the middle third of the common bile duct

On the basis of clinical and anamnestic data, carried out diagnostic studies, the patient was diagnosed with: “GSD. Acute calculous cholecystitis. Choledocholithiasis. Mirizzi syndrome type 2. Complication: MJ. Secondary: Obesity - 1st degree.

Taking into account the stable condition of the patient, low rates of bilirubinemia, the presence of a calculus in the middle third of the choledochus on MRI cholangiography up to 1.5 cm in size, discrepancy between the size of the calculus and the diameter of the distal choledochus (up to 5 mm), it was decided to refrain from performing ERCPG. After preliminary preparation, the patient was urgently operated.

The operation was performed: laparoscopic subtotal cholecystectomy from the fundus. Choledocholithoextraction through the fistula. Drainage of the common bile duct according to Kehr through the vesicocholedochal fistula with covering the defect of the wall of the common bile duct in the area of the vesicocholedochal fistula with a flap from the left part of the posterior wall of the gallbladder, formed around the Kehr drain in the form of a "cystic duct". Drainage of the abdominal cavity.

Brief protocol of the operation. During the revision of the abdominal cavity, the gallbladder is shrouded in a large omentum measuring 10x5 cm, of a dense consistency, the walls are edematous, thickened. Stones are not palpated in the cavity. The cystic duct is not visualized, the neck of the bladder passes into the common bile duct, forming a vesicocholedochal fistula (Fig. 7). The choledochus is dilated to 1.5 cm. Palpation in the choledochus in the projection of the cystic duct is determined by a calculus up to 1 cm. A subtotal cholecystectomy was performed, leaving the neck. On examination, a cholecystocholedochal fistula measuring 10 mm is noted (Fig. 8).

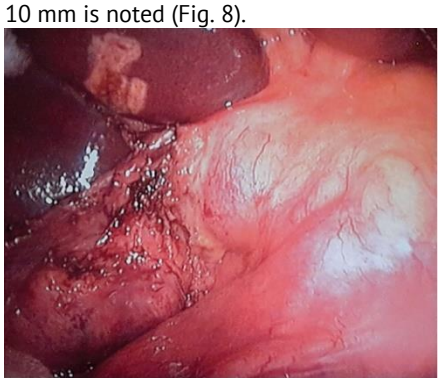

Fig. 7. The neck of the gallbladder passes into the common bile duct, forming a vesicocholedocheal fistula

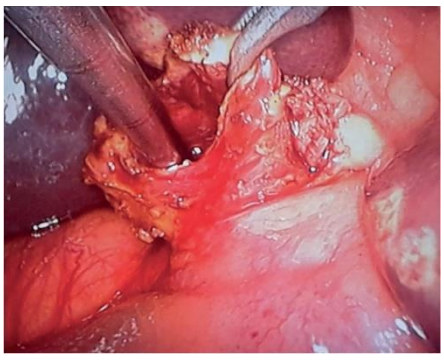

Fig. 8. The left part of the gallbladder and vesicocholedocheal fistula

Further, the residual neck of the bladder was opened up to the choledochus. One calculus 10 mm in size was removed from the choledochus through the fistulous tract using Mirizzi forceps (Fig. 9). Light bile flows from the common bile duct. An intraoperative cholangiography was performed (Fig. 10), no other stones were found. Drainage of the choledochus according to Kehr through the fistulous tract with covering the defect of the wall of the choledochus in the area of the vesicocholedochal fistula with a flap from the left part of the posterior wall of the gallbladder, formed around the Kehr drain in the form of a "cystic duct". Drainage of the abdominal cavity (Fig. 11).

Fig. 9. Removal of calculus from the common bile duct with Mirizzi forceps

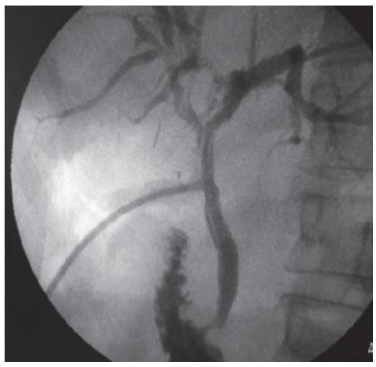

Fig. 10. Intraoperative cholangiography

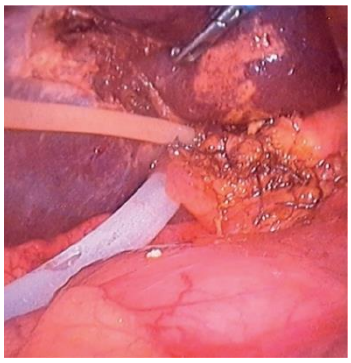

Fig. 11. Kehr-type T-tube drainage of the common bile duct through the fistulous passage with the formation of a “cystic duct”. Drainage of the abdominal cavity

The postoperative period was uneventful. The wound healed by first intention. On the 4th day after the operation, the drainage from the abdominal cavity was removed. The patient in a relatively satisfactory condition on the 5th day was discharged for outpatient treatment at the place of residence with a Kehr drain with a recommendation to clamp the Kehr drain 2 weeks after the operation. A month after the operation, the Kehr drain was removed, while the flow of bile or the formation of a biliary fistula was noted.

For a method of closing a defect in the wall of the choledochus in the area of the vesicocholedochal fistula with a flap from the remains of the posterior wall of the gallbladde neck, we filed an application for an invention, for which a positive decision was received from the Intellectual Property Agency of the Republic of Uzbekistan No. IAP 20190005 dated 03/25/2019.

CONCLUSIONS

1. The inclusion of endoscopic retrograde cholangiopancreatography, percutaneous transhepatic cholangiography and magnetic resonance tomography cholangiography in the diagnostic scheme improves the accuracy and quality of Mirizzi syndrome recognition and allows evaluating indications for the use of video laparoscopy.

2. The indication for laparoscopic treatment of Mirizzi syndrome type 2 is the presence of a single calculus in the supraduodenal choledochus, which reduces the number of conversions to laparotomy.

3. In cases of Mirizzi syndrome type 1, the operation of choice is laparoscopic cholecystectomy.

4. The operation of choice in patients with type 2 Mirizzi syndrome is laparoscopic subtotal cholecystectomy, plastic surgery of the fistula with a gallbladder flap on the Kehr drain with the formation of a cystic duct type clutch.

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