

# Diagnosis and Surgical Treatment of Patients with Mirizzi Syndrome

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## ABSTRACT

**Introduction.** Among patients undergoing cholecystectomy, the Mirizzi syndrome (MS) occurs from 0,06% to 5,7%, and it is a difficult problem in all stages of diagnosis and surgical treatment. To make a correct diagnosis in the all modern methods, surgical intervention may be done in less than in 12-32% cases. **Materials and methods.** From 1994 to 2016, 122 patients with MS (20 to 84 years old, on average 50,9±0,5 years old) were operated. Patients were separated by the Csendes classification of MS. Taking into account the development of diagnosis system, the choice of tactics and mode of operative treatment, all patients were divided into two groups. Control group including 69 patients were operated from 1994 to 2008 and the main group contained 53 patients operated from 2009 to 2016. On a number of clinical and laboratory methods of investigation it was applied modern instrumental investigation methods such as: x-ray examination of gastro-intestinal tract, ultrasound investigation (USI), multi spiral computer tomography (MSCT), endoscopic examination of stomach and duodenum, endoscopic retrograde pancreaticholangiography (ERPCHG), percutaneously-transhepatic cholangiography. **Results.** The diagnostic value of USI before operation was in the following: suspicion of I type of MS was noted in 24,3% of patients, in 37,6% of patients it was suspected the existent of II-IY types. On USI before operation in 5,4 % of patients it was verified I type and in 18,8 % of patients II-IY type of MS. The use of MRI and MSCT in MS verification may increase the efficacy of diagnosis particularly in 2 times in the comparison with USI. But, for patients with MS 1 type, this indication remains relatively low and composes only 33,3%. This method of diagnosis is more effective in patients with MS 2-4 type because of exact diagnosis in 75,0% cases. The most detailed verification was noted on ERPCHG in MS 1 type (83,3%). In SM 2-4 type the efficacy of ERPCHG was 81,4%. Uncomplicated post-operative period was noted in 83,0% of patients of main group, while in patients of control group this indication was only 56,5%. Such difference was noted both in indications of lethality (1,9% in main group against 7,2% in control) and in specific complications (15,1% in main group against 39,1% in control). **Conclusion.** It is concluded that the significant increasing of topical diagnosis level of MS 1 type in main group (till 42,9%), and for patients with MS 2-4 type this indication in main group increased till 19,2% in the comparison with control group. At the same time, stepwise use of all complex of diagnostic monitoring may increase the efficacy of correct diagnosis till 97-99% in patients with MS 2-4 type. In pre-established MS 1-2 type it is more effectively the using of laparoscopic interventions, and in cases of MS 3-4 type a priority remains for the choice of open operations (CHEC+draining of choledocha by Ker).

## Original Article

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Mirizzi Syndrome,  
Mechanical Jaundice,  
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Spiral Tomography.

## INTRODUCTION

Mirizzi syndrome (MS) is quite rare pathology, the incidence of it among elder population composes of less 1% in a year in developed Western countries and 4,7-5,7% in developing countries [1-5]. A number of observations of Mirizzi syndrome is increasing at recent years, which associated with increase of morbidity of bile stone diseases, decreasing of surgical activity in acute cholecystitis attack and examination of patients, surgery progress of bile ducts, best knowledge of surgeons of this complication. At present, by the data of most authors,

the rate of morbidity of Mirizzi syndrome composes of 0,3-5%, and among patients with bile stone disease – 0,1-2,7% [3, 4, 6-13].

The standard in pre-operative diagnosis of Mirizzi syndrome for several decades is the methods of direct contrast of bile ducts. Among them the most often using method is endoscopic retrograde cholangiopancreatography, which is thought by some authors more informative in diagnosis of syndrome [6, 14]. Other authors indicate on high sensitivity and safety of pre-operative diagnosis methods such as spiral computer tomography, magnetic resonance cholangiopancreatography [14, 15, 16].

The issues in regard to surgical correction of Mirizzi syndrome remain undecided. In modern surgery there are different ways of treatment of this syndrome. They may be divided in endoscopic and surgical. Laparoscopic treatment methods are used successfully in I type of syndrome. At the same time, some authors consider that the syndrome of Mirizzi is absolute or relative contraindication for laparoscopic operation, especially not diagnosed in pre-operative period [16]. Antoniou et al. [6] in the literature review on using of laparoscopic technique in syndrome of Mirizzi points to 40% of access conversion, 20% of complications and 6% of repeated operations. But there are a number of publications, which authors point to possibility of using of laparoscopic technique under certain conditions [17-21]. Kwon and Inui [15] point to possibility of applying of laparoscopic method by experienced surgeon only in first type of syndrome.

Today the most of surgeons choose the performing of cholecystectomy from the bottom, completed with draining of choledocha [4, 22-24]. Difficulties in diagnosis, as well as necessity of modern their methods involving, enough wide range of using and recommending methods of surgical treatment, a few observations, and absence of single recommendations determine the actuality of studying of this problem.

## MATERIAL AND METHODS

The work was based on retrospective analysis of investigations of 122 patients with MS, treated in surgery departments of liver and bile ducts, and portal hypertension and pancreatoduodenal zone in republican specialized center of surgery named after V. Vakhidov from 1994 to 2016. Taking into account the development of diagnosis system, the choice of tactics and way of operative treatment all patients were divided into two groups. In control group it was included 69 patients, who were operated from 1994 to 2008. The main group contained 53 patients operated from 2009 to 2016.

The age of patients varied from 20 to 84 years old (on average  $50,9 \pm 0,5$  years old). The females were more – 88 patients against 34 male patients (the ratio 2,6:1). The main complains, having in admission, were pains on right upper quadrant of abdomen, periodical icterus of skin covering and sclera, clinical manifestations of cholangitis in the form of chill, increasing of body temperature. The pains on right upper quadrant of abdomen were noted by 122 (100%) patients, clinic of mechanical jaundice was observed in 90 (73,7%) of patients. The incidence of cholangitis was noted by 23 (18,8%) patients. In 7 (5,7%) patients there was incidence of hepatic insufficiency.

Terms from the beginning of disease to the moment of admission into clinic were different in our patients and varied from 1 month to 33 years, and in some cases the duration of disease was unknown, including patients with asymptomatic cholechololithiasis. Duration of bile stone history was as follows: till 1 years in 45 (36,9%) patients, from 1 to 3 years in 14 (11,5%) patients, more than 3 years in 56 (45,9%) patients, and in 7 (5,7%) patients the duration of disease was not identified. In 30 (24,5%) patients the attack of pains was the first time and in 92 (75,5%) patients there were two or more attacks in history. Symptoms of mechanical jaundice in history were observed in 21 (17,2%) patients.

Along with the clinical and laboratory methods of investigation it was applied modern instrumental investigation methods such as: x-ray examination of gastro-intestinal tract, ultrasound investigation (USI), multi spiral computer tomography (MSCT), endoscopic examination of stomach and duodenum, endoscopic retrograde pancreatocholangiography (ERPCHG), percutaneously-transhepatic cholangiography. Including of one or another method into investigation was determined with the help of appropriate indications. The tactics of surgical treatment of patients with MS was made depending on the type of syndrome. Patients were distributed with the help of Csendes A classification for MS (Table 1).

### Ethical approval

The review board and ethics committee of RSCS named after acad. V.Vakhidov approved the study protocol and informed consents were taken from all the participants.

**Table 1.** Distribution of patients by the type of Mirizzi syndrome (MS)

Type of SM	Main group		Control group		All	
	abs.	%	abs.	%	abs.	%
Type I	14	26,4%	23	33,3%	37	30,3%
Type II	13	24,5%	24	34,8%	37	30,3%
Type III	23	43,4%	19	27,5%	42	34,4%
Type IV	3	5,7%	3	4,3%	6	4,9%
Total	53	100,0%	69	100,0%	122	100,0%

abs. = absence of single recommendations

## RESULTS AND DISCUSSION

In our clinic it was hospitalized 16549 patients with bile stone disease. From this group 14820 (89,5%) patients were operated. Other patients were discharged because of different reasons (severity of concomitant diseases, necessity of rehabilitation after elimination of the block for bile flow in mechanical jaundice (MJ), abandonment of an operation and other). In general, for the whole group of operated patients the developing rate of MS composed 0,82% (122 from 14820 patients). For all 122 patients it was made the USI of organs of abdomen. From the data of [table 2](#), which shows diagnostic efficacy of USI in verification of this diagnosis, it has been mentioned that the most low diagnostic efficacy of USI has been noted in group of patients with SM I type, with largest percentage of not established diagnosis.

Active using of MRI and MSCT in surgery of liver and extrahepatic bile ducts, which attracted specialist dealing with the problem of MS, allowed significantly increasing percentage of exact diagnosis. In [table 3](#) it was showed the indications of efficacy assessment of MRI and MSCT using in our patients. The using of MRI or MSCT in verification of MS may increase the efficacy of diagnosis practically in 2 times in comparison with USI. But, for patients with MS type 1 this indication remains relatively low and composes only 33,3%. The highest efficiency of this diagnosis method is determined in patients with SM 2-4 type with exact made diagnosis in 75,0% of cases. Next, it is performing of ERPCHG, which is not only diagnostic stage but also realizes treatment function. Indications of efficacy of ERPCHG in diagnosis of MS were presented in [table 4](#). From the [table 4](#), it is noted more meaningful verification of ERPCHG in MS 1 type (83,3%). In SM 2-4 type the efficacy of ERPCHG composed 81,4%. On the [Picture 1 \(A, B\) and 2](#) it is demonstrated all parties of ERPCHG of topical diagnosis of MS.

Results in a cumulative distribution of patients by type of performed operative treatment are presented in [table 5](#). One should mention, the specter of operative intervention variants have been practically identical in both groups that characterize persistent conservatism in choice of operative approach during long-term period, except the using of holedohoduodenoanastomoz (CHDA), which at present practically is not applied. At the same time, a number of open cholecystectomy (CHEC) with draining of choledocha by Ker, at present, is dominant operation in MS and corresponds to modern standards in the choice of operative treatment type.

In [table 6](#) it is noted the increasing of laparoscopic intervention rate performed in control group (9,4% against 3,8%), in the smallest amount of conversion (3,8% against 15,9% respectively). Nevertheless, amount of open operative interventions was practically the same in both groups. The distribution of patients depending on the performing of stage tactics in MS is presented in [table 7](#), which shows that this indication composed 37,7% in main group against 10,1% in control group. Such big difference in indications points to significant changes in MS treatment tactics of complicated mechanical jaundice (MJ) with mandatory use of one of the ways of biliary decompression before main operative stage.

The most principal moment in benign surgical pathology is assessment of this type of intervention by recent results. Assessment of surgical treatment of patients with MS we decided to consider with position: 1) analysis of recent results of surgical treatment of MS in comparison groups; 2) comparison analysis of structure and the rate of post-operative complications depending on the type of MS; 3) distribution of post-operative complications depending on the type of operation; 4) assessment of surgical intervention risk in patients with MS.

As can be seen from diagram 3, which shows general structure of comparison results of surgical treatment of MS, it is mentioned significant difference by all indications in comparison groups. Thus, uncomplicated post-operative period was noted in 83,0% of patients of main group, while in patients of control group this indication composed only 56,5%. Such difference was noted both in indications of lethality (1,9% in main group against 7,2% in control) and specific complications (15,1% in main group against 39,1% in control).

Next analyzed item was to study the rate of post-operative complications depending on the type of MS (Table 8). Thus, the seam failure of choledocha was noted in 1 patients (7,1%) with MS 1type and in 4 (15,4%) patients with MS 3-4 type in main group. In control group this complication was noted in 2 patients (8,7%) with MS 1 type, in 4 patients (16,7%) with MS 2 type and in 5 patients (22,7%) with MS 3-4 type.

**Table 2.** Diagnostic efficacy of USI in verification of MS

Type of MS	Number	Suspicion on MS		Accurately verified		Undiagnosed	
		abs.	%	abs.	%	abs.	%
type I	37	9	24,3%	2	5,4%	26	70,3%
Type II-IV	85	32	37,6%	16	18,8%	37	43,6%
Total	122	41	33,6%	18	14,7%	63	51,7%

**Table 3.** Diagnostic efficacy of MRI and MSCT in verification of MS

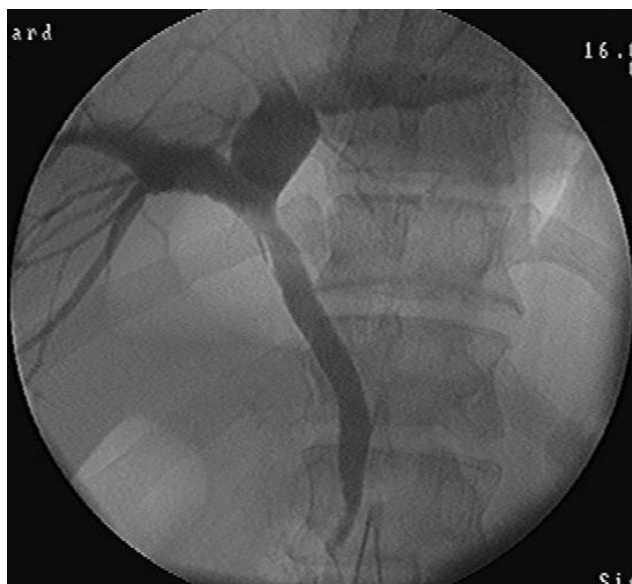
Type of MS	Number	Suspicion on SM		Accurately verified		Undiagnosed	
		abs.	%	abs.	%	abs.	%
Type I	9	3	33,3%	3	33,3%	3	33,3%
Type II-IV	45	6	15,0%	33	82,5%	6	15,0%
Total	54	9	16,7%	36	66,6%	9	16,7%

**Table 4.** Diagnostic efficacy of ERCHPG in verification of MS

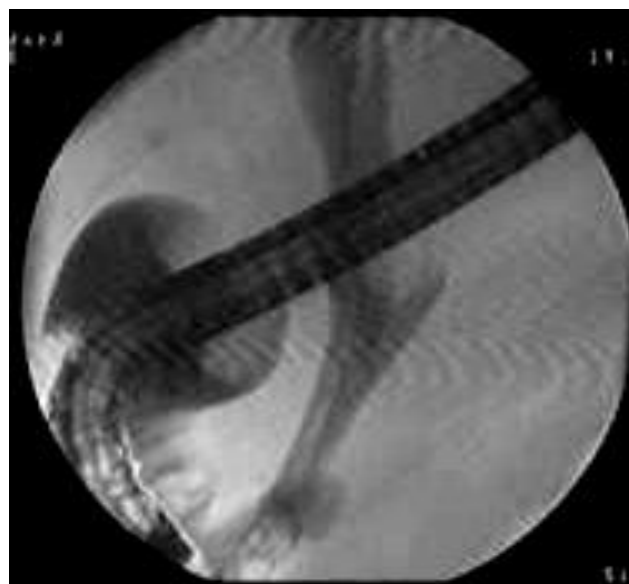
Type of MS	Number	Suspicion on MS		Accurately verified		Undiagnosed	
		abs.	%	abs.	%	abs.	%
Type I	6	2	33,3%	3	50%	1	16,7%
Type II-IV	70	10	14,3%	47	67,1%	13	18,6%
Total	76	12	15,8%	50	65,8%	14	18,4%

**Table 5. A cumulative distribution of patients by type of performed operative treatment**

Type of operation	Control group		Main group	
	abs.	%	abs.	%
<b>Open operation</b>	<b>55</b>	<b>79,7%</b>	<b>42</b>	<b>79,2%</b>
Cholecystectomy	11	15,9%	4	7,9%
CHEC+draining by Ker	15	21,7%	27	50,9%
CHEC+plastic+ draining by Ker	17	24,6%	3	5,7%
CHEC+ Pikovskiy	5	7,2%	3	5,7%
HepJA	3	4,3%	2	3,8%
CHEC, restoring hepatiko choledocha on carcass drainage	2	2,9%	3	5,7%
CHEC, dissociation of duodenal fistula, application of HepDA	2	2,9%	0	0,0%
<b>Laparoscopic anastomosis</b>	<b>2</b>	<b>2,9%</b>	<b>5</b>	<b>9,4%</b>
<b>Laparoscopic operation with draining of choledocha by Pikovskiy</b>	<b>1</b>	<b>1,4%</b>	<b>2</b>	<b>3,8%</b>
<b>Laparoscopic operation with draining of choledocha on T- shaped drainage</b>	<b>0</b>	<b>0,0%</b>	<b>2</b>	<b>3,8%</b>
<b>Laparoscopy with conversion</b>	<b>11</b>	<b>15,9%</b>	<b>2</b>	<b>3,8%</b>
Cholecystectomy	3	4,3%	3	5,7%
CHEC+draining by Ker	5	7,2%	3	5,7%
CHEC+plastic+ draining by Ker	4	5,8%	1	1,9%
CHEC+ Pikovskiy	1	1,4%	0	0,0%
HepJA	0	0,0%	1	1,9%
CHEC, restoring hepatiko choledocha on carcass drainage	4	5,8%	1	1,9%
CHEC, dissociation of duodenal fistula, application of HepDA	3	4,3%	1	1,9%



A) Gallbladder was arrested. GHD was squeezed from the outside, along the lateral contour, perhaps by gallbladder (MS 1 type). Suprastenotic ectasia of right, left and general hepatic ducts.

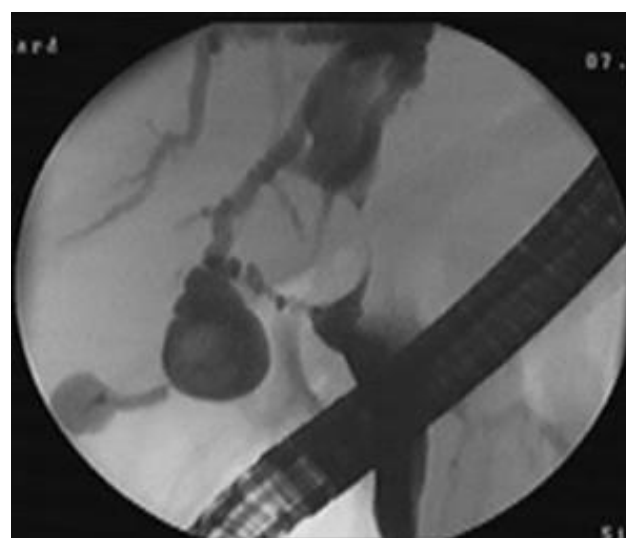


B) Gallbladder was arrested. GHD was squeezed from the outside (MS 2 type), with the aim of decompression of biliary tract it was performed the stenting of general bile duct.

**Picture 1 A, B.** Imaging of MS in its EPHGDS verification



A) On the level of confluence of cystic duct there is repletion defect, deforming lateral contour of general hepatic duct. Intrahepatic ducts and general hepatic duct (GHD) above the level of compression are enlarged (MS 3 type)



B) Symptom of «sandglass» with defect of the whole semicircle repletion of GHD (MS 4 type). Slow roundabout contrast of proximal part of choledochus at the expense of vesicular-choleodocic fistula

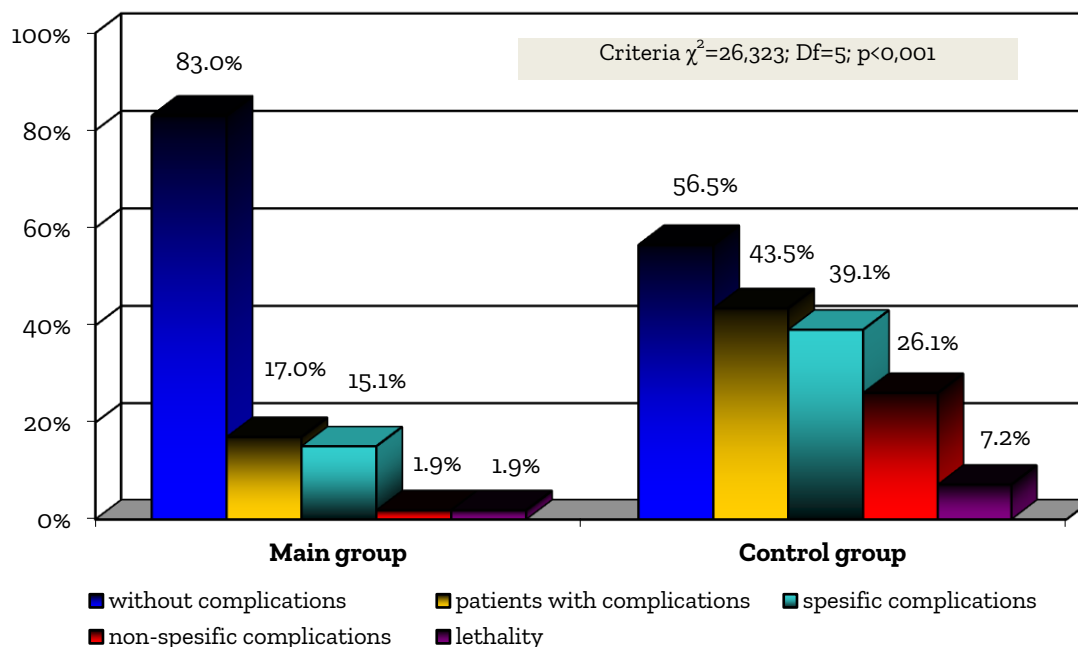
**Picture 2 A, B.** Imagine of MS in its EPHGDS verification

**Table 6.** Type of operative treatment of Mirizzi syndrome in comparison groups

Type of operation	Main group		Control group		All	
	abs.	%	abs.	%	abs.	%
Open operation	42	79,2%	55	79,7%	97	79,5%
Laparoscopic operation	9	17,0%	3	4,3%	12	9,8%
Laparoscopy with conversion	2	3,8%	11	15,9%	13	10,7%
Criteria of authenticity by operation type	$\chi^2=9,030; Df=3; p=0,037$					
Open and laparoscopy with conversion	44	83,0%	66	95,7%	110	90,2%
Total	53	100,0%	69	100,0%	122	100,0%

**Table 7.** The distribution of patients by the type of two-stage intervention

First stage of treatment	Main group		Control group	
	abs.	%	abs.	%
PTCHG	8	15,1%	2	2,9%
Nosobiliary draining	7	13,2%	3	4,3%
Lost drainage	5	9,4%	2	2,9%
Total	20	37,7%	7	10,1%
Criteria of authenticity	$\chi^2=8,527$ ; Df=3; p=0,047			



**Diagram 3.** Results of surgical treatment of MS

**Table 8.** The rate of post-operative complications depending on the type of MS

The group and type of operation	The seam failure of choledocha		Progression of liver insufficiency		Bleeding		Residual stone		Non-specific complications of organs		Suppuration of wound or sub diaphragmatic abscess	
	abs.	%	abs.	%	abs.	%	abs.	%	abs.	%	abs.	%
<b>Control group</b>												
Type I of MS	2	8,7%	1	4,3%	0	0,0%	1	4,3%	6	26,1%	0	0,0%
-Open operation	2	13,3%	1	6,7%	0	0,0%	0	0,0%	6	40,0%	0	0,0%
-Laparoscopic operation	0	0,0%	0	0,0%	0	0,0%	1	50,0%	0	0,0%	0	0,0%
Type II of MS	4	16,7%	1	4,2%	0	0,0%	3	12,5%	4	16,7%	2	8,3%
-Open operation	3	16,7%	1	5,6%	0	0,0%	2	11,1%	3	16,7%	2	11,1%
-Laparoscopy with conversion	1	16,7%	0	0,0%	0	0,0%	1	16,7%	1	16,7%	0	0,0%
Type III and IV of MS	5	22,7%	4	18,2%	2	9,1%	1	4,5%	8	36,4%	1	4,5%
-Open operation	5	22,7%	4	18,2%	2	9,1%	1	4,5%	8	36,4%	1	4,5%
<b>Main group</b>												
Type I of MS	1	7,1%	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%
-Open operation	1	12,5%	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%
Type II of MS	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%
Type III and IV of MS	4	15,4%	0	0,0%	1	3,8%	1	3,8%	1	3,8%	1	3,8%
-Open operation	4	15,4%	0	0,0%	1	3,8%	1	3,8%	1	3,8%	1	3,8%

The low diagnostic efficiency of USI in verification of MS was noted in group of patients with MS I type, with the highest percentage of not established diagnosis (57,1% in main and 78,3% in control groups). Nevertheless, in main group almost in 2 times it was increased the percentage of typing diagnosis. The highest percentage of correct made diagnosis was noted in patients with MS II-IV type (23,1% against 15,2% respectively). In main group of patients with MS II-IV type it was decreased significantly the percentage of unverified diagnosis (30,8% against 54,3% respectively).

Verification of diagnosis on the base of totality of main USS signs of MS allows to increase diagnostic efficacy of this method till 18,9% in all types, and for 2-4 type particularly till 23,1%. The use of MRI and MSCT in verification of MS allows increasing the efficiency of diagnosis in 2 times in comparison with USS. But, for patients with MS 1 type this indication remains relatively low and composes only 33,3%. The highest efficiency of this diagnosis method is revealed in patients with MS 2-4 type with exact made diagnosis in 75,0% cases. The efficacy of ERPCHG in MS 1 type composes 66,7%, and in MS 2-4 type it increases till 75,8%, which associated with increasing of efficiency of beam diagnostic methods, not with the improvement of technical components of this method. It was noted significant increasing of topical diagnosis level of MS 1 type in main group (till 42,9%), and for patients with MS 2-4 type this indication in main group increased till 19,2% in comparison with control group. At the same time, stage using of all complex of diagnostic monitoring may increase the efficacy of making of correct diagnosis till 97-99% in patients with MS 2-4 type.

The use of stage surgical tactics, when on the first stage it was performed one of the variants of small-invasive biliary tract decompression, was characterized with the increasing of amount of planned surgical interventions (90,6% against 69,6%), the highest percentage of applying of laparoscopic technologies (16,98% against 4,35%) in minimal quantity of conversion (3,8% against 15,94%) and as a result: uncomplicated post-operative period was noted in 83,0% of patients of main group, while in patients of control group this indication composed only 56,5%. Such difference was noted both in indications of lethality (1,9% in main group against 7,2% in control) and specific complications (15,1% in main group against 39,1% in control).

Renouncement from emergency surgery in favor of actively expectant tactics in MS allows to increase the rate of good results after operation till 26,5%, to reduce the quantity of specific and non-specific post-operative complications till 24,0% and 24,2% respectively, and lethality till 5,3%.

## CONCLUSION

The main tasks of therapeutic and diagnostic tactics in MS in the condition of given qualified and specialized medical care are follows:

- Collection of anamnestic data and determination of risk factors of MS developing;
- Use of high technologic beam diagnosis with establishment the character of complication;
- Assessment of efficiency of combined use of all diagnostic complex in MS verification;
- Assessment of severity stage of clinical course of syndrome, determination of complicated course of underlying disease and concomitant pathology;
  - In patients with MJ, the first stage of therapeutic tactics is one of the ways of small-invasive endoscopic or endovascular decompression of biliary tract;
  - In preliminarily established MS 1-2 type the preference should be given to laparoscopic intervention, and in the case of revealing of MS 3-4 type the priority remains for the choice of open operation (CHEC+draining of choledocha by Ker).

## DECLARATIONS

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### Authors' Contributions

All authors contributed equally to this work.

### Competing interests

The authors declare that they have no competing interests.

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