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GALLSTONE DISEASE AND BILIARY PANCREATITIS COMPLICATED BY MECHANICAL JAUNDICE. REVIEW

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Abstract

Introduction: Combined diseases of the digestive system are established in every third patient hospitalized in surgical hospitals. However, simultaneous operations in comorbidity are performed in 1-5% of cases, reaching in some surgical clinics 6% of all surgical interventions performed. The combination of cholelithiasis (GSD), peptic ulcer disease, pancreatitis, and their complications deserve special attention, in which close topographic anatomical and functional relationships lead to interdependent damage to related organs. In recent years, there has been an increase in the incidence of diseases of the organs of the hepatopancreatoduodenal system (GPDS).

Aim: To review the literature on gallstone disease and biliary pancreatitis complicated by mechanical jaundice.

Search strategy: Literature search was carried out in search engines: Pubmed, Google Academy, elibrary.ru, as well as "manually". The search depth of Pubmed, Google Academy, elibrary.ru, as well as "manually", was not limited. The following filters were applied: full text, humans. *Criteria for inclusion of publications in the review:* publications that are in full-text access, in Russian and English, carrying statistically verified conclusions. *Exclusion criteria:* duplicate data, summaries of reports, newspaper publications, personal communications.

Results: The syndrome of mechanical jaundice complicates the course of various diseases of the hepatopancreatobiliary zone, the common clinical sign of which is icteric staining of the sclera and skin as a result of an increase in the concentration of bilirubin in the blood due to impaired patency of the bile ducts. One of the main problems of hepatopancreatobiliary surgery at the present stage is the improvement of existing and the introduction into clinical practice of new methods for early differential diagnosis of the causes of obstruction of the bile ducts and the development of mechanical jaundice. Diagnosis of mechanical jaundice includes two fundamental points: confirmation of the obstructive nature of jaundice and determination of the specific cause of violation of the patency of the extrahepatic bile ducts. The timeliness of the diagnostic search largely determines the choice of an adequate surgical tool to restore the outflow of bile from the liver.

Conclusions: Thus, we see that over the past decade, the tactics of surgical treatment of patients with obstructive jaundice have changed significantly, the most popular are minimally invasive methods for prosthetics of the biliary function. Combined hybrid methods for the treatment of benign structures of the biliary system are being introduced more and more.

Keywords: *Pancreatitis, acute biliary pancreatitis, choledocholithiasis, cholelithiasis, obstructive jaundice, bile ducts.*

Резюме

ЖЕЛЧЕКАМЕННАЯ БОЛЕЗНЬ И БИЛИАРНЫЙ ПАНКРЕАТИТ, ОСЛОЖНЕННЫЙ МЕХАНИЧЕСКОЙ ЖЕЛТУХОЙ. ОБЗОР ЛИТЕРАТУРЫ.

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Введение: Сочетанные заболевания органов пищеварения устанавливаются у каждого третьего больного, госпитализируемого в хирургические стационары. Однако, симультанные операции при сочетанной патологии выполняются в 1-5% случаев, достигая в отдельных хирургических клиниках 6% от всех выполняемых хирургических вмешательств. Особого внимания заслуживает сочетание желчнокаменной (ЖКБ), язвенной болезней, панкреатита и их осложнений, при котором тесные топографоанатомическое и функциональное взаимоотношения приводят к взаимообусловленному поражению связанных между собой органов. В последние годы отмечено увеличение частоты заболеваний органов гепатопанкреатодуоденальной системы (ГПДС).

Цель: провести обзор литературы о желче-каменной болезни и билиарному панкреатиту, осложненной механической желтухой.

Стратегия поиска: Поиск литературы осуществлен в поисковых системах: Pubmed, Google Академия, elibrary.ru, а также «ручным способом». Глубина поиска Pubmed, Google Академия, elibrary.ru, а также «ручным способом», не была ограничена. Применялись следующие фильтры: full text, humans. *Критерии включения публикаций в обзор:* публикации, находящиеся в полнотекстовом доступе, на русском и английском языках, несущие статистически выверенные выводы. *Критерии исключения:* повторяющиеся данные, резюме докладов, газетные публикации, личные сообщения.

Результаты: Синдром механической желтухи осложняет течение различных заболеваний гепатопанкреатобилиарной зоны, общим клиническим признаком которых является желтушное окрашивание склер и кожных покровов в результате повышения концентрации билирубина в крови вследствие нарушения проходимости желчевыводящих протоков. Одной из основных проблем гепатопанкреатобилиарной хирургии на современном этапе остаётся совершенствование существующих и внедрение в клиническую практику новых методов ранней дифференциальной диагностики причин непроходимости желчных протоков и развития механической желтухи. Диагностика механической желтухи включает два основополагающих момента: подтверждение обтурационного характера желтухи и определение конкретной причины нарушения проходимости внепечёночных желчных протоков. Своевременность диагностического поиска во многом обуславливает выбор адекватного оперативного пособия для восстановления оттока желчи из печени.

Выводы: за последнее десятилетие значительно изменилась тактика хирургического лечения пациентов с механической желтухой, наибольшую популярность приобретают малоинвазивные методы протезирования желчевыводящей функции. Все больше внедряются комбинированные гибридные способы лечения доброкачественных структур желчевыводящей системы.

Ключевые слова: Панкреатит, острый билиарный панкреатит, холедохолитиаз, желчекаменная болезнь, механическая желтуха, желчные пути.

Түйіндеме

**ӨТ ТАС АУРУЫ ЖӘНЕ МЕХАНИКАЛЫҚ САРҒАЮМЕН АСҚЫНҒАН
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Кіріспе: асқорыту органдарының аралас аурулары хирургиялық стационарларға жатқызылған әрбір үшінші науқаста белгіленеді. Алайда, аралас патологиядағы симуляциялық операциялар жағдайлардың 1-5% - орындалады, жеке хирургиялық клиникаларда орындалатын барлық хирургиялық араласулардың 6% - на жетеді. Өт тас (СКД), ойық жара аурулары, панкреатит және олардың асқинуларының үйлесуі ерекше назар аударуға тұрарлық, онда тығыз топографиялық-анатомиялық және функционалдық қатынастар өзара байланысты органдардың өзара байланысты зақымдалуына әкеледі. Соңғы жылдары гепатопанкреатодуоденальды жүйе (ГПДЖ) органдарының ауруларының жиілігінің артуы байқалды.

Мақсаты: өт тас ауруы және механикалық қабықпен асқынған билиарлы панкреатит туралы әдебиеттерге шолу жасау.

Іздеу стратегиясы: әдебиеттерді іздеу жүйелерінде жүзеге асырылады: Pubmed, Google академиясы, elibrary.ru, сондай-ақ "қолмен". Pubmed іздеу тереңдігі, Google академиясы, elibrary.ru, сондай-ақ "қолмен", шектелмеген. Келесі сүзгілер қолданылды: full text, humans. *Басылымдарды шолуға қосу критерийлері:* толық мәтінді қол жетімді, Орыс және ағылшын тілдеріндегі, статистикалық тексерілген қорытындылары бар басылымдар. *Ерекшелік критерийлері:* қайталанатын деректер, баяндамалардың қысқаша мазмұны, газет басылымдары, жеке хабарламалар.

Нәтижелер: механикалық жултуха синдромы гепатопанкреатобилиарлы аймақтың әртүрлі ауруларының ағымын қиындатады, олардың жалпы клиникалық белгісі өт жолдарының патенттілігінің бұзылуына байланысты қандағы билирубин концентрациясының жоғарылауы нәтижесінде склера мен терінің сарғаюы болып табылады. Қазіргі кезеңдегі гепатопанкреатобилиарлы хирургияның негізгі проблемаларының бірі-өт жолдарының бітелу себептерін ерте дифференциалды диагностикалаудың жаңа әдістерін жетілдіру және клиникалық тәжірибеге енгізу және механикалық қабықтың дамуы. Механикалық қабықтың диагностикасы екі негізгі тармақты қамтиды: сарғаюдың обтурациялық сипатын растау және бауырдан тыс өт жолдарының патенттілігінің бұзылуының нақты себебін анықтау. Диагностикалық іздеудің уақтылығы көбінесе бауырдан өт ағынын қалпына келтіру үшін тиісті жедел жәрдем таңдауды анықтайды.

Қорытынды: осылайша, соңғы онжылдықта механикалық сарғаюы бар науқастарды хирургиялық емдеу тактикасы айтарлықтай өзгергенін көреміз, өт шығару функциясын протездеудің минималды инвазивті әдістері ең танымал болып табылады. Өт шығару жүйесінің қатерсіз құрылымдарын емдеудің біріктірілген гибриді әдістері барған сайын енгізілуде.

Түйін сөздер: *Панкреатит, жедел билиарлы панкреатит, холедохолитиаз, өт тас ауруы, механикалық сарғаю, өт жолдары.*

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Introduction

Acute pancreatitis is now becoming more frequent worldwide, especially among people of working age. In the CIS countries incidence of pancreatitis among adults makes 27-50 cases per 100 thousand people [36]. As some authors consider in people suffering from pancreatitis and cholelithiasis in 30-40% of cases the syndrome of obstructive jaundice develops. Unresolved mechanical jaundice itself is a life-threatening condition. At surgical interventions of pancreas 15-25% of cases end up with lethal outcome. That is why surgical treatment of pancreatitis combined with subhepatic cholestasis syndrome is of special interest. There is a good progress in surgical pancreatology, but the results of complicated forms of chronic pancreatitis treatment are not quite satisfactory [66]. In life-threatening complications of pancreatitis different surgical methods are used, but they require systematization [42]. As there are different operative approaches and clinical observations are heterogeneous [84]. Surgical treatment of chronic pancreatitis has many variants, but in order to stabilize pathological process after the operation it is necessary to start operative intervention in time.

Aim: To review the literature on gallstone disease and biliary pancreatitis complicated by mechanical jaundice.

Search strategy: The following search engines were used for the literature search: Pubmed, Google Academy, elibrary.ru, and 'manual'. We chose the following PubMed search strategy for mechanical jaundice, cholelithiasis, biliary pancreatitis (MeSH Terms: obstructive jaundice; cholelithiasis; gallstone pancreatitis). The depth of the search in Pubmed was not limited. The following filters were applied: full text, humans. A total of 2346 publications were retrieved, of which 89 met the aim of our study. Google Academy search strategy: keywords: epidemiology of acute calculous cholecystitis. A total of 1,890 publications were retrieved, out of which 47 met the objective of our study. In our literature search for biliary pancreatitis, we chose the following PubMed search strategy (MeSH Terms: gallstone pancreatitis). The depth of the search was not limited. A total of 763 publications were found for the given query, of which 37 publications fulfilled the purpose of our study. Elibrary.ru search strategy: keywords: gallstone disease, biliary pancreatitis, mechanical jaundice, diagnosis, surgical treatment, endoscopic treatment. We found 689 publications for the given query, out of which 27 publications met the purpose of our study. Google Academy

search strategy: keywords cholelithiasis, biliary pancreatitis, mechanical jaundice, diagnosis, surgical treatment, endoscopic treatment. We retrieved 361 publications on the given query, and 29 of them corresponded to the purpose of our study. *Criteria for inclusion of publications in the review:* publications in full-text access, in Russian and English, carrying statistically verified conclusions. *Exclusion criteria:* abstracts of reports, newspaper publications, personal communications.

Results

Gallstone disease (GBS) is a disease of the gastrointestinal tract, which is very common in women and elderly people. It is characterized by the formation of gallstones in the gallbladder and, less frequently, in the bile ducts. Gallstones are detected in approximately 10% of people in the United States and Western Europe, and in 70 to 80% of people gallstones do not cause any symptoms, i.e. are asymptomatic. It is noted that gallstones often cause such complications as cholangitis, biliary pancreatitis, and mechanical jaundice.

Gallstones are crystalline structures formed by coalescence of normal or abnormal bile components. According to some researchers [54], cholesterol stones and pigmented stones form, with cholesterol and mixed stones accounting for 80% of all stones. Cholesterol and cholesterol stones consist of more than 70% cholesterol monohydrate and an admixture of calcium salts, bile acids, pigments, proteins, fatty acids and phospholipids; pigmentary stones are composed mainly of calcium bilirubinate, and less frequently (10%) of cholesterol. In economically developed countries, pigmentary stones are found in 20 to 25% of cases. There are also black and brown stones which are based on calcium bilirubinate. Patients who suffer from alcoholism and cirrhosis, as well as patients who are on prenatal nutrition form black stones, but brown stones are formed in the bile ducts. These stones also contain cholesterol and mucus. Overweight and rapid weight loss are common risk factors that predispose to stone formation.

10 - 20% of patients who are on a low-calorie diet form gallstone. Under normal conditions, the gallbladder is filled during the interdigestive period, and in some patients the volume of the gallbladder may increase. Under normal conditions, food reaches the duodenum, thus emptying 70 - 80% of its total volume noted in the interdigestive period, but the decrease of prolonged physical activity gradually leads to a decrease of gallbladder contraction expression,

which promotes the formation of gallstones. Delayed emptying of the gallbladder is the cause of recurrence.

Recreational physical activity is known to be an important risk factor for gallstone formation in women, both as an independent factor and through its role in weight maintenance. A sedentary lifestyle in women is directly associated with an increased risk of gallstone formation [80].

Pathogenesis of gallstone formation.

Various theories on the causes of gallstone formation are discussed whenever possible, including infectious, metabolic and congestive. Currently, however, the cause of gallstone formation is often attributed to a combination of the following factors:

1) excess (oversaturation) of cholesterol in the bile and insufficient excretion of bile salts, phosphatidylcholine, and phospholipids into the bile, resulting in calcified bile.

2) Excessive cholesterol is formed in cholesterol vesicles (spherical particles with bile coating of cholesterol and phospholipids).

3) Aggregation and coalescence of these particles leads to the formation of small monohydrate cholesterol crystals in bile.

4) Atony of the gallbladder decreases the possibility of complete emptying and increases the size of cholesterol crystals that in turn obstruct (block) the bile ducts in the distal direction.

5) Increased secretion of estrogen mainly affects women, which may explain the higher incidence of CGD in women compared to men.

6) development and progression of biliary mucosal inflammation, which usually involves the gallbladder and extrahepatic bile ducts;

7) an important factor in gallstone formation is the condition of the small intestine, which in combination with the state of the gallbladder determines the recirculation of bile acids and the speed of their movement through the liver

Considering the above factors in more detail, it should be noted that in patients with cholelithiasis an important pathological factor is the delay (increase) of transit time through the intestine, especially through the duodenum. Gastrointestinal (GI) motility disorders occur even before gallstones are formed, and GI motility disorders are associated with obesity, diabetes, pregnancy, decreased gallbladder motility and bile secretion after meals, and postprandial bile discharge from the gallbladder and bile acid recirculation. Bile retention increases gallbladder emptying and the likelihood of cholesterol crystallization. Cholesterol crystals accumulate and turn into macroscopic stones when the gallbladder is not emptied properly (patients with GID often have inadequate gastric emptying and low bile secretion afterwards). According to the World Society of Gastroenterology (Bangkok, 2002), impaired emptying of the gallbladder is caused by inflammatory damage to the mucous membrane, mechanical obstruction (obstruction) of the gallbladder and autonomic denervation. Inflammation of the gallbladder mucosa causes cholecystitis, and inflammation of the bile ducts causes cholangitis.

Cholecystiasis is a term that reflects the presence of stones in the bile ducts. The stones can enter the common bile duct from the gallbladder or can form directly in the

common bile duct. An important factor in formation of stones in the common bile duct is an inflammatory process (cholangitis). Cholangitis occurs in 15% of cases of cholelithiasis. Choledithiasis can have experimental signs of jaundice and bile stasis. There is a parallel relationship between the degree of obstruction and the bilirubin level, mainly due to the rectal fraction, which can be up to 20-30 times the normal level. Alkaline phosphatase activity may increase 3-6 times, but not significantly. In some patients cholelithiasis is asymptomatic. However, serious complications occur in 25-50% of patients with cholelithiasis (cholangitis or stony pancreatitis 75%), and 40% of cases of acute pancreatitis are related to cholelithiasis.

Sludge: In GIHD, a so-called "sludge" ("putty" bile), consisting of a mixture of mucus, cholesterol and calcium bilirubin crystals together with gallstones, can be found. For a relatively long time, this sludge was considered a safe phenomenon associated with impaired gallbladder emptying, especially with total parenteral nutrition and pregnancy emptying. Recently, however, it has been established in gastroenterology [78] that sediment is a risk factor for chronic cholestatic pancreatitis and cholangitis. It has also been suggested that sediment. However, it is not clear whether the sediment always causes cholelithiasis. And should sediment always be considered a necessary sign of cholelithiasis? Only 30% of those examined have subsequently formed gallstones from the sludge. This seems to be related to the molecular concentration-dependent solubility of cholesterol in bile. In the other patients the sludge then resolved spontaneously without formation of gallstones in the gallbladder or bile duct (in the absence of symptoms that might be associated with gallbladder disease). In patients with dyspepsia and abdominal pain the resolution of dyspepsia [77] occurred in 50%, gallstone formation in 5%-15%, and complications such as pancreatitis, cholangitis and gallstones in 10%-15%. It is obvious that lumps are only a potential, but not a necessary risk factor for GIHD, chronic pancreatitis and cholangitis. Other pathological factors (possibly unchanged) must also be involved in the development and presence of lumps, and gallstones, the absence or deficiency of which is one of the causes of lump breakdown.

Clinical manifestations of cholelithiasis. There are often symptoms caused by inflammation and obstruction of gallstones due to their moving in the gallbladder and bile ducts, namely biliary cramps (severe pain in the right subcavity often accompanied by nausea and heaviness in the right subcavity after consuming alcohol or fatty foods or doing physical work). The pain sometimes spreads throughout the stomach and radiates to the right scapula and right shoulder. Biliary colitis may be accompanied by nausea, vomiting, fever (cholecystitis) in some patients, and elevated bilirubin levels. Biliary colitis can occur at night or two to three hours after a meal, when bile begins to flow into the duodenum. Biliary colic can last from a few minutes to several days. Biliary colic is usually considered specific to the presence of gallstones, but according to the Medline database from 1966 to 1998, 80% of patients have other abdominal symptoms [78].

When the common bile duct or cystic duct is obstructed, the pressure in the lumen increases, the lumen dilates and does not disappear after repeated contractions. This causes

severe pain and pressure in the subclavian area and right upper abdomen. Pain, nausea and indigestion in the right lower chest, with or without irradiation to the back, can also occur in other diseases.

Normal bile is usually sterile. Obstruction by gallstones, whatever the cause, can interfere with the flow of bile, resulting in jaundice and direct bilirubin in the urine. If bacteria penetrate the bile duct, which often happens when the wall of the duct is damaged by gallstones, an abscess can develop, which is accompanied by the corresponding clinical symptoms, which should be considered an early stage in the development of GIHD [20].

Many patients with cholelithiasis experience only blunt pain in the lower ribs, sometimes accompanied by complaints of indigestion, which are often prolonged and more or less intermittent. Chololytic disease can also be asymptomatic. The risk of developing so-called "gallbladder pain" in asymptomatic carriers is 1-4% per year; some patients with CLL may have a variety of clinical symptoms associated with other comorbidities.

Biliary pancreatitis is known to be at risk for acute or chronic pancreatitis in patients with GSD. The probability of developing biliary pancreatitis is 25-49%. In practice, the term biliary pancreatitis has been used for a relatively long time to differentiate gastrointestinal pancreatitis. Recently, the term biliary pancreatitis has been regularly "pushed" to replace the term biliary pancreatitis. According to some researchers [47] the term biliary pancreatitis or biliary dependent pancreatitis should be used exclusively for bile duct and gallbladder stones.

Pathological aspects of the progression of biliary pancreatitis in GIHD.

The occurrence and progression of biliary pancreatitis may be primary or secondary, depending on the primary influence of one or more "mechanical" factors contributing to the occurrence and progression of pre-existing pancreatitis, according to our observations:

1) the occurrence of primary biliary pancreatitis is related to GI disease, and/or cholelithiasis, and/or mechanical sphincter Oddi dysfunction (e.g. e.g. microlithiasis) as the cause;

2) development of secondary cholestatic pancreatitis is related to previous development of chronic pancreatitis, mainly due to involvement of diffuse pancreatic head, which gradually enlarges and compresses (narrows) the bile duct end with development of sclerotic lesions in the bile duct end and dilation of its proximal part).

Swelling and fibrosis of the pancreas can also lead to compression of the bile ducts and the surrounding blood vessels. Transient jaundice is caused by pancreatic edema during an exacerbation of chronic pancreatitis, whereas permanent jaundice is caused by bile duct obstruction by pancreatic head fibrosis. In mild bile duct obstruction, serum alkaline phosphatase is usually elevated minimally. Inflammation and fibrosis of the tissues surrounding the pancreas can compress the pancreas, as well as cause thrombosis of the splenic vein, superior mesenteric vein and portal vein, although a clear clinical picture of portal hypertension is rarely seen in patients frequently admitted to general hospitals.

In 1892, A.W. Mauon-Robson operated on a patient with a severely enlarged pancreatic head due to chronic

pancreatitis for mechanical jaundice [9]. This was the first case in the literature when secondary cholestatic pancreatitis caused bile duct stenosis and manifested clinical symptoms, which are now considered to be typical for obstructive jaundice.

However, the most common cause of biliopancreatitis is a stone impinging on the ampulla of the fourth nipple, which increases pressure on the main pancreatic duct and contributes to the onset and development of pancreatic inflammation and clinical symptoms. Small gallstones, which keep the gallbladder mobile and crystallize rapidly, can cause pancreatitis. Patients with at least one gallstone less than 5 mm in diameter have a fourfold increased risk of developing acute biliary pancreatitis." [63]. As the number and size of gallstones increase, the clinical picture of CLL changes, and the frequency and severity of the pain syndrome decreases (until the characteristic right-subcostal pain disappears altogether).

The frequency of chronic pancreatitis is four times higher in patients with Oddi sphincter dysfunction [99] compared to patients without Oddi sphincter dysfunction. One of the causes of chronic pancreatitis is an obstruction of the main pancreatic duct by scar papillary stenosis. Bile duct obstruction is mainly caused by high pressure on the base of the Oddi sphincter, which prevents it from relaxing. Pancreatic sphincter dysfunction in the greater duodenal papilla (a variant of Oddi sphincter dysfunction) can also cause chronic biliary pancreatitis and cholangitis, as well as long-term stenosis of the bile duct, which is not clinically manifested by mechanical jaundice [55]. "A stone lodged in the fourth bile duct papilla is one of the typical causes of cholangitis and/or biliary pancreatitis.

Clinical manifestations of cholestatic pancreatitis.

Gastrointestinal pancreatitis can occur as acute pancreatitis or recurrent chronic pancreatitis of varying severity. Recurrent chronic pancreatitis may proceed with clinical signs considered typical of acute pancreatitis, but the intensity of the pain syndrome may be intermittent or constant, although often not felt. Acute pancreatitis is a serious complication of GI that initially proceeds with obvious clinical symptoms [4], but often progresses to complications, justifying the need for immediate admission to a surgical hospital and subsequent emergency treatment of patients with acute pancreatitis.

MJ syndrome complicates the course of several GPBZ diseases, with a common clinical manifestation being jaundice of the sclerae and skin as a result of elevated blood bilirubin levels due to bile duct obstruction.

At this stage, one of the fundamental problems of hepatobiliary and pancreatic surgery is specification of existing methods in clinical practice and introduction of new methods for early differential diagnostics of the reasons of biliary obstruction and DIB development. DIB diagnosis includes two basic situations: confirmation of the obstructive character of jaundice and determination of a concrete reason of violation of patency of extrahepatic bile ducts. Early diagnosis largely determines the choice of appropriate surgical additional measures to restore bile outflow from the liver.

No absolutely bad prognostic clinical symptom is typical for obstructive biliary CF of certain etiology or class [23] According to Y.L. Shevchenko and P.S. Vetshev (2008), on

the basis of basic information of physical examination, physical examination and the most important data of clinical examination, obstructive jaundice can be suspected in 78% of patients [52].

Diagnostic and routine errors occur in 10-42% of cases, resulting in delayed search of true cause of VL, delayed necessary surgical intervention, purulent cholangitis, hepatic abscess, biliary sepsis and rapid PU progression that is fatal in 14-27% of cases [52]. At a certain stage of progression, jaundice is not just a syndrome, but an important factor with its own pathophysiological and clinical features, determining the severity of the patient's condition and disease prognosis [11].

The main causes of prehospital diagnostic errors depend on many factors *I.S. Malkov et al.* (2014) classify them as follows:

1. GPBZ cancerous organ lesions without pain syndrome. These patients rarely seek medical care before the onset of MH. The main complaints are itching, malaise, weakness, anorexia, and weight loss. However, these alarming symptoms are not recognized, and symptomatic treatment is prescribed.

2. Outpatients are diagnosed on the basis of biochemical markers and abdominal ultrasound (USG) findings; elevated OB and transaminases are often interpreted as manifestations of chronic hepatitis or cirrhosis. Such patients are referred for consultation to an infectious disease specialist or gastroenterologist. Often due to insufficient outpatient ultrasound experience, the degree of intrahepatic biliary tract dilatation, which is the first response to the development of obstructive biliary stasis, cannot be determined.

3. Clinical signs of cholangitis masquerading as acute respiratory infection can be recognized only when skin and visible mucous membranes are darkened. Previously, the patient underwent a long examination to determine the cause of the fever [31].

Thus, as a result of prehospital diagnosis errors, 17.4% of patients with obstructive jaundice were admitted to a surgical hospital between 14 and 26 days after the onset of the disease [17]. Cholestatic hypertension and biliary stasis developing for a long time can cause deep morphological and functional changes in the liver, resulting in fast progressing PU [50]. According to *Y.L. Shevchenko et al.* 22% of patients with MH were admitted to surgical departments of infectious or gastroenterological hospitals [52].

Laboratory tests in MJ syndrome are not definitive in determining the etiology of biliary obstruction. Generally accepted biochemical parameters are used to determine severity of biliary stasis, cytolytic activity, and synthetic status of liver function.

For verification of cancer in GPBZ organs, levels of cancer marker α -fetoprotein and carbohydrate antigen CA19-9 are measured. However, it should be remembered that CA19-9 is excreted only with bile, so serum bilirubin may cause elevation of this marker value. Sensitivity and specificity of CA19-9 in diagnostics of pancreatic cancer make up 70-95% and 72-90%, respectively [70].

The results of research aimed at searching for alternative methods for differential diagnostics of MG: according to *A.V. Mosyagin* (2008) absolute and relative

levels of general phospholipids of blood serum are two times lower in patients with obstructive jaundice in comparison with patients with chronic viral hepatitis B. In biliary obstruction the level of sphingomyelin was significantly lower than in patients with chronic viral hepatitis B. In biliary obstruction the percentage content of sphingomyelin was significantly lower compared with gallbladder disease [34].

Teryokhina N.A. and Zarivchatsky M.F. (2007) developed a noninvasive laboratory method of MJ diagnosis including enzymatic analysis of tear fluid [43].

Pyankova O.B. et al. (2010) proposed an improved method of differential diagnosis of MJ based on the analysis of morphological and radiological structure of facies (crystalline imprints obtained by fluid dehydration) of bile, blood serum and abdominal exudate. A comparison of the results of the analysis of the crystal structure of body fluids and the quantification of oncomarkers in blood serum in patients with MJ showed a much greater concordance between the initial and final diagnosis in the morphological analysis of facies [39].

Since there is little experience in the use of these methods for differential diagnosis in MJ laboratories, it is too early to draw conclusions about the practical validity of these tests.

Given reasonable assumptions about the mechanistic nature of jaundice, the next stage of validation should include local diagnostic use.

Noninvasive or invasive instrumental examination is necessary to determine the cause of MJ and the degree of biliary obstruction. Screening methods of instrumental diagnosis include ultrasound of the GPBZ organs and esophagogastroduodenoscopy (EGDS) with inspection of the BMD area [5].

Ultrasound is the first noninvasive radiological imaging modality for BPH pathology. Ultrasound assesses size, structure, and clear contour of the liver and pancreas, shape and thickness of gallbladder wall, presence of echogenic structures in gallbladder and extrahepatic bile ducts, as well as presence of volumetric masses in GPBZ. Biliary hypertension (dilation of extrahepatic and intrahepatic bile ducts) is the main ultrasound findings in biliary obstruction. Some authors believe that finding the cause of biliary obstruction (tumorous or neoplastic) is not the main issue at the initial stages of diagnosis in patients with BBB [48]. It is important to confirm the presence of biliary hypertension and determine the degree of biliary obstruction. For example, distal biliary obstruction is characterized by hepatobiliary dilatation of hepatopancreatic duct, and at late stages - by dilatation of intrahepatic ducts and gallbladder enlargement (Courvoisier syndrome). There is no consensus about what abnormal dilatation of duodenum represents. Many authors consider dilation of gallbladder up to 8-10 mm as an ultrasound sign of biliary hypertension [13]. In patients with proximal biliary obstruction, ultrasound investigation can show dilation of intrahepatic bile ducts, and not only distal biliary system, where stenosis is suspected, cannot be described, but also gallbladder can collapse.

Many authors note that the accuracy of ultrasound in determining the level of tumor block is 90-98% and 73%-89% for specific causes of biliary obstruction [14].

According to *Y.L. Shevchenko et al. (2008)*, the sensitivity of ultrasound to determine the cause of ileal obstruction was 87.7%, 98.3% for GI disease, 63.9% for GPBZ tumors, and 85.4% for overall specificity [52].

Many authors have noted that the accuracy of ultrasonography to determine the extent of tumor obstruction is 90-98%, and for some causes of obstruction, the accuracy ranges from 73% to 89%. [14].

According to *Y.L. Shevchenko et al. (2008)*, the sensitivity of ultrasound in detecting the cause of breast cancer was 87.7%, GI diseases 98.3%, GPBZ tumors 63.9%, and overall specificity was 85.4% [52].

False-negative and false-positive ultrasound results in patients with cholelithiasis were 27.6% and 13.8%, respectively (20). False-negative results may be due to poor delineation of bile ducts due to intestinal obstruction or poorly defined "spotty" bile ducts. False-positive ultrasound findings are due to misidentification of stenosis or fibrous casts as bullae; the diagnostic value of ultrasound in detecting cholangiocarcinoma in VGN is unsatisfactory [13].

Ultrasonography and endoscopic ultrasonography (EUS) performed during EGDS have gained high diagnostic value; a meta-analysis conducted by L. Palazzo summarized data from 11 major studies to evaluate the diagnostic efficacy of EUS. To evaluate diagnostic efficacy of EUS versus lithography he summarized data from 11 basic studies with 1470 cases, noting that all but one showed high sensitivity and specificity, 88-93% and 94-98%, respectively, in detecting duodenal cancer. EUS had 100% sensitivity, 75% specificity, and 87.5% diagnostic accuracy, as well as 97.4%, 81.2%, and 89.3% in the diagnosis of residual neoplasia of the ileum [75]. In chronic pancreatitis, the underlying cause of MB, EUS has a sensitivity of 86.2%, specificity of 88.8%, and diagnostic accuracy of 87.3% [22]. An indisputable advantage of EUS is the possibility of tissue biopsy using precise needle punctures. EUS is not a method for screening diseases of GPBZ organs, but it occupies an intermediate position between noninvasive and invasive tests in the diagnostic algorithm and is indicated in complicated clinical situations.

Multislice computed tomography (MSCT) is a very useful method to determine the cause of biliary obstruction; according to *V.A. Vishnevsky (2004)*, MSCT reveals the degree of biliary obstruction in 98.1% of cases [7]. The use of contrast bolus at MSCT allows to detect cholesterol flocculi. However, undiagnosed cases of cholelithiasis caused by cholesterol stones make up 7.7% of cases. The accuracy of MSCT with contrast bolus is estimated as 97.7% when detecting retrostenotic tumors [23]. The number of false positive MSCT in diagnostics of cancerous lesions of pancreas reached 5.3% that is associated with difficulty of differential diagnosis with fibrous inflammatory processes in pancreatic tissue. MSCT is more useful for detection and assessment of the extent of cancerous processes in parenchymal organs of the PS, but it is more sensitive than radiographic methods of direct contrast in choroïd, MSCT is less sensitive in diagnosis of intravascular pathological changes; MSCT is useful as a method to determine the presence of cancerous lesions [23].

Many authors report the effectiveness of magnetic resonance imaging (MRI) and magnetic resonance cholangiopancreatography (MRCPG) in diagnosing the

causes of biliary obstruction and MI development [27]. Conventional CT images are baseline images for MRI cholangiopancreatography; 3D reconstructions using maximum intensity projection algorithm are created based on MRI data. The simulated 3D image helps to determine the spatial proportions of the bile duct, duodenum, and duodenum. MRCT accuracy in diagnostics of diseases of bile ducts, liver, pancreas and large pancreatic ducts reaches 93.1%; in 81.4% of cases MRCT allows to define the level, degree and cause of bile duct obstruction [52]; The diagnostic value of 3D MRCP is comparable with a direct technique of bile ducts contrasting and comparable with invasive radiological studies; typical complications are excluded; according to *S.N. Kononenko (2011)*, MRCP is a method of choice in all cases when an accurate preoperative diagnosis cannot be realized by ultrasound [23].

In a systematic review in the Cochrane Community Library, *Giljaca V. et al. (2015)* published a comparative assessment of EUS and MRCPG informativeness in the diagnosis of cholangiolipitis as a cause of MI. The review included 18 studies summarizing the results of a diagnostic search in 2,366 patients; the sensitivity and specificity of EUS for the detection of cholangiopathy enlargement were 91-97% and 94-99%, respectively, and of MRCPG 87-96% and 90-98%. The authors concluded that the diagnostic accuracy of the two techniques is approximately equivalent, and the choice depends on the technical equipment of the hospital and the presence of contraindications for EUS or MRCPG [71].

According to *T.V. Koryakina (2015)*, in the diagnosis of cholelithiasis, combined ultrasound and MRCT had sensitivity 65.9% and 98.8%, specificity 63.6% and 96.7% and diagnostic accuracy 65.6% and 98.2%. For diagnosis of a perineal mass, combined ultrasound and MRCT had sensitivity of 84.5% and 99%, specificity of 90.9% and 90.9% (no significant difference), and diagnostic accuracy of 85.2% and 98.1%. In the differential diagnosis between benign and malignant breast cancer, the sensitivity, specificity, and diagnostic accuracy of integrated ultrasound, and MRI were 79.5% and 98.2%, 90.0% and 99%, and 81.1% and 98.7%, respectively [24].

Direct radiographic imaging of the bile ducts with contrast agent is the most important method of treating CPN. These include percutaneous transhepatic cholangiography (PTCG) and endoscopic retrograde pancreaticobiliary cholangiography (ERCPG), which should be performed at the end of the diagnostic algorithm. Both techniques carry surgical risk and are unsafe in terms of complications, occurring in 3-5% of cases, with a mortality rate of 0.2% [16]. The undoubted advantage of this technique is that it can be combined simultaneously with various decompressive interventions.

The use of CDCG and ERCPG for diagnosing MS progression is currently not uniformly confirmed in national and international publications. Some authors apply the term "gold standard" for confirmation of obstructive jaundice and determination of the degree of biliary obstruction to direct biliary angiography with percutaneous transhepatic and endoscopic biliary techniques. For example, *N.I. Zabavina et al. (2009)* considered hCG as a non-alternative diagnostic intervention for proximal biliary obstruction [16].

On the other hand, *R.Sh. Shaimardanov et al.* (2009) estimated the sensitivity of ECG in detecting proximal biliary obstruction at 95-97% [49]. We believe that such extreme views may not reflect the real significance of these methods in the diagnosis of MJ syndrome in terms of scientific evidence. The choice of retrograde or percutaneous contrast biliodissection is determined by the presumed degree of obstruction; according to *A.N. Lotov and P.S. Vetshev* (2004), BCG is indicated for high degree of biliary tract involvement [28]. However, in complicated clinical situations a combination of endoscopic and antidiabetic treatment can be justified.

The success rate of cholangiography on CBCG was 97.8%, and ERCPH was achieved in 93% of patients [27].

The diagnostic significance of CBCG according to *S.V. Limonchikov* (2011) was 97.8%. Complications were detected in 2.2% of patients [26].

The sensitivity and specificity of ERCPG are 89.3% and 94.7% respectively, and it is especially useful in patients with cholelithiasis, BVRS, tumors of VBG, stenosis of extrahepatic bile ducts and sclerosing cholangitis [58]. Complications of ERCPH are sometimes fatal and occur in 3.9% of cases [35].

Analysis of literature data shows, that direct contrasting of bile ducts with ERCPG and CDCG gives more accurate picture of bile ducts changes. However, lesions outside the rectum are difficult to detect with high reliability, and they can be assessed only by indirect signs [27].

Fibrocollagenoscopy is an informative and less traumatic diagnostic method used in endoscopic and percutaneous transhepatic interventions. This technique is technically simple and safe for the patient and is used as a final diagnostic step and for monitoring intracavitary treatment [64].

Angiography (ventriculography, repeat mesenteric portography) is widely used to assess the resectability of GPBZ neoplasms and determine the spread of blastocystic proliferation in large vessels. However, 30% of patients with hPBBB and perirenal renal pelvis carcinoma cannot undergo radical surgery because of local spread of the process, even in cases recognized as resectable by angiography [38].

Therefore, the results of angiography should be evaluated in conjunction with the data of other methods.

Thus, various modern methods of investigation determine the necessity of further improvement of complex approach to the diagnosis of the cause of MB and the degree of biliary obstruction.

Treatment of cholelithiasis and biliary pancreatitis complicated by obstructive jaundice.

In the case of DF syndrome complicated by pyogenic cholangitis, thrombohemorrhagic syndrome, and PU, traditional surgical treatment is rather risky and associated with a high mortality rate.

According to *Tarassenko S.V.* (2012), since 2000 hospitalization of patients with benign etiology of MB has increased by 85.5%, and in patients with tumorous affection of BP organ - more than three times [41]. In surgical admissions for breast cancer, the proportion of tumor causes ranges from 25.5-59%, and non-tumor causes from 11.6-74.4% [74]. Postoperative mortality in patients with MH remains consistently high. For example, in patients with

neoplastic obstructive jaundice this rate varies from 4.8% to 7.2%, while in patients with malignant neoplasms of GSD it reaches 28-31% [69].

The resolution of the XX International Congress of Hepatologic Surgeons "Topical problems of Surgical Hepatology" (2013) states that ETPV is the most effective and common method of resolving stenotic lesions in cholelithiasis and LAD. The resolution states. In solitary stones up to 1 cm in size and in the absence of LAD lesion, balloon papillary aspiration for stone removal is reasonable. When there are large stones (>2 cm) in the duct, violent transparenchymal extraction should be avoided. Intravesical lithotripsy and staged stone removal are indicated. If this is not possible, surgical removal is necessary. Cholecystolithotomy, including gallbladder suture fusion, depending on the adequacy of previously performed EPST. High-risk patients with inoperable large cholelithiasis should undergo temporary bilioduodenal stenting or permanent bilioduodenal stenting to ensure bile outflow.

Of further interest is a systematic review of the Cochrane Library by *Dasari B.V.M. et al.* (2013), aimed at comparing open, endoscopic, laparoscopic and their combined methods in bile duct stone disease. The authors summarized the results of 16 randomized controlled trials (RCTs) covering the treatment experience of 1758 patients: mortality in patients with GSD complicated by MH syndrome, frequency of postoperative complications, number of cases of residual bile duct stones, technical failures and cost of surgical treatment, which determined the effectiveness of traditional open surgery in comparison with minimally invasive interventions. The efficacy of traditional laparotomy and minimally invasive interventions was assessed. One of the criteria for comparing the results of minimally invasive interventions was the rate of access conversions. There were no significant differences between open surgery, laparoscopic cholelithotomy (LHLT) and endoscopic lithotripsy (ELE) in terms of mortality or rate of postoperative complications; the rate of residual bile duct stones in patients after LHLT and ELE was the same and higher than after laparoscopic surgery.

The authors of this review believe that more RCTs on this issue are needed to rule out random and systematic errors in confirming the results of this analysis [62].

The simplest method of temporary biliary drainage is the use of a transpapillary plastic stent, which can be replaced after 2-3 months. If endoscope is not available, instead of stenting an external-internal drainage of bile duct and staged balloon dilatation of stricture can be performed. If minimally invasive treatment is inefficient, reconstructive surgery is indicated; cicatricial stenosis of LP should be considered as contraindication to stenting. When treating this category of patients, routine antegrade balloon dilatation of the stenosis should be combined with replacement of transhepatic external-internal drainage with a larger diameter drain (14Fr). This procedure should be repeated every 2-3 months until the balloon waist disappears completely.

Only 5-23% of cases of GSD organ tumors can be operated for therapeutic purposes even in specialized clinics [18]. Most operations performed for malignant GSD organ tumors are palliative and concern mainly one or another technique of biliary drainage. The incidence of

postoperative complications is 79-86%, and the mortality rate is 40-57% [46].

In patients with inoperable GBD tumors and MZ syndrome, the main criterion for choosing a palliative intrabiliary drainage procedure is life expectancy.

In a study by A.S. Maada (2015), the following clinical and instrumental prognostic factors were identified to assess life expectancy in patients with inoperable GBD tumors and MZ syndrome.

- Patient age.
- Level of bilirubinemia 1-3 days before primary bile duct drainage;
- Patient's physical condition as assessed by the ASA scale;
- Weight loss (kg) prior to primary admission;
- Organ tumor affiliation;
- Size of primary tumor (mm);
- Local tumor invasion into adjacent organs;
- Tumor invasion into major blood vessels;
- Ascites (including subclinical);
- Degree of tumor differentiation;
- Presence or absence of metastases to lymph nodes;
- Presence or absence of distant metastases [30].

At present for biliary drainage and restoration of bile flow the following methods are widely used: percutaneous transhepatic, endoscopic transpapillary, surgical, endoscopic, as well as combined and combined interventions. As a rule, the choice of biliary drainage method is based on the technology and staffing of the hospital [45]. In these circumstances, it is impossible to objectively consider the therapeutic potential of each method in terms of evidence-based medicine. On the other hand, the choice of intervention method is also complicated by the fact that different types of biliary decompression in patients with MB in most cases have the same effect.

The first group of techniques - Muller was the first to perform such an intervention for benign stenosis of extrahepatic bile ducts; according to R. Watanapa and R.C.N. Williamson (1992), who summarized the treatment experience of more than 2500 patients with distal tumorous block; R.C.N. Williamson (1992), who summarized the treatment experience of more than 2500 patients with distal tumorous block, success rate of endoscopic drainage is 82-100% [103].

The desire to improve the quality of life of patients with MJ syndrome due to inoperable GPBZ tumors and to avoid bile loss led to the development of internal biliary drainage, in which a plastic stent-drain is inserted into the bile duct. This intervention was first reported by W. Molnar and Stockum in 1992; W. Molnar and Stockum in 1974 [87]; and W. Molnar and Stockum in 1976 [100]. Currently, biliary stents are improved and actively introduced into clinical practice for treatment of patients with malignant MZ syndrome. However, there are still opinions on expediency of biliary bypass shunt-anastomosis formation for patients with distal tumor block of the biliary tract.

Complications of endoscopic bilioduodenal stenting vary from 5.9 to 31.7% and, according to some data, 46-61.6% [100]. Cholangitis accounts for 12.7-50.9%, the occurrence of which is associated with the failure of drainage function of the stent rather than with biliary reflux [86]. Lethality varies from 2.3% to 12.7% [87].

Cholecystectomy is one of the most accessible methods of surgical decompression; according to G.I. Zhidovinov (1987), mortality in external drainage of gallbladder at the stage of clinical implementation reached 12.4% [15]. Laparoscopic cholecystectomy (LCE) reduced the number of forced surgical interventions in patients with UC more than three times, mortality rate also decreased up to 3.5% [6]. Bleeding from gallbladder anastomosis can be limited because of possible narrowing of vesicoureteral duct by a tumor.

Surgical formation of BDA remains effective today, having such advantages as generally easier access and less recurrence of MB compared to various endobiliary stenting procedures [90]. Laparoscopic surgery provides long-term drainage benefits, but postoperative complications occur in 30.5% of cases and the mortality rate is 14% [8].

Liver enteroanastomosis (CEA) has the widest indication. The incidence of late complications is negligible. This anastomosis is preferred in patients with inoperable cholangiopancreatobiliary tumors complicated by MJ, when survival is predicted to be more than 6 months. Currently, minimally invasive surgical repair of MB has a complication rate of no more than 10-15% and a mortality rate of 2.5% [28].

A systematic review by Moss et al. (2009) compared endobronchial decompressive pneumoperitoneum (BDA formation) with endoscopic transpapillary (plastic and metal stents) in patients with bile duct syndrome due to unresectable GVHD tumors. The analysis is based on the results of 29 studies combining the results of endobiliary drainage in 1700 patients with inoperable IVC tumors. Antegrade bile duct stenting was not included into the review. Comparison of intravesical bile duct drainage variants the literature lately mainly recommends to use percutaneous and endoscopic transvesical biliary decompression.

At the same time analysis of Russian and international literature reveals the following controversies concerning the tactics of MB syndrome palliation and restoration of bile duct patency:

- Selection of biliary drainage method based on prognostic survival factors in patients with malignant bile duct obstruction;
- Percutaneous transhepatic and transpapillary biliary drainage for different types of bile duct obstruction.
- Formation of the virioduodenal stent or BDA in patients with benign and malignant biliary obstruction;
- Plastic or self-expanding metal stents (SMS) in various types of biliary obstruction combined with MH;
- Endoscopic transpapillary stenting (ETPS) with or without EPST pretreatment - benefits of coated and uncoated MSCs;
- Unilateral or bilateral stenting in patients with IBD due to neoplastic biliary block.

The principle of staging in the treatment of patients with IBD is currently recognized by the majority of surgeons in the country [51]. The first stage is biliary tract decompression and maximum resolution of hyperbilirubinemia. The second stage in the "non-biliary" period can include radical or palliative surgery for biliary tract tumors and reconstructive surgery for benign stenosis

of extrahepatic bile ducts [44]. On the other hand, many foreign authors question the expediency of preoperative biliary decompression, especially in patients undergoing radical surgery [61].

In the meta-analysis *Fang Y. et al.* (2013), which combined six randomized studies of the effectiveness of preoperative decompression (retrograde or percutaneous), it was noted that the number of postoperative complications was significantly higher in patients who underwent preoperative biliary drainage before radical intervention, compared with those who did not [68]. Similar results were obtained in meta-analyses *Liu F. et al.* (2011), *Sun C. et al.* (2014) and *Van Heek N.-T.* A similar result was also obtained in the meta-analysis by *et al.* (2014) [82].

In two systematic reviews in Cochrane Library *Wang Q. et al.* (2008) and *Fang Y. et al.* (2012) summarized data of 11 studies aimed to evaluate efficiency of preoperative biliary drainage in patients with BW. The authors compared the results of radical surgery and biliary resection method (percutaneous or transcapillary) in patients who underwent biliary decompression and those who didn't. Comparison was made according to the following indices: length of hospital stay (total and postoperative bed-days), mortality and incidence of postoperative complications (specific and nonspecific). Specific complications of surgical treatment included cholangitis, cholestatic sepsis, intra-abdominal bleeding, cholestasis, and pancreatitis, while nonspecific complications were assessed by the frequency of wound infection, acute myocardial infarction (AMI), pneumonia, and renal failure. The analysis revealed no differences in mortality rates between patient groups. The incidence of postoperative complications in patients who never underwent biliary tract decompression and in those who underwent percutaneous transhepatic drainage was also comparable. The incidence of postoperative complications was higher in the group of patients who underwent transhepatic biliary drainage. Patients who underwent preoperative biliary decompression for 8-17 days had a longer total hospital stay. There was no difference in the duration of postoperative inpatient rehabilitation. However, despite the analysis of a significant number of articles, the authors came to the same conclusion about insufficiency of evidence due to the low methodological level of the articles included in the systematic review, indicating the need for new RCTs on specific issues [102].

Of interest is the original study by *Bapat R.D. et al.* (1995) "Can we do away with PTBD" ("Can we do away with PTBD"). Patients were divided into four groups:

- 1, patients with cholangioma before surgery;
- 2, patients without cholangioma;
- 3, patients with cholangioma who received *Tinospora cordifolia* squeeze before resection intervention;
- 4, patients without cholangioma who received *Tinospora cordifolia* squeeze and Patients who received internal treatment. Based on the analysis of postoperative mortality, the authors concluded that the best treatment outcomes were achieved in Group 4 patients and that preoperative biliary decompression was unwise.

Two conflicting views on the staged approach in the treatment of MB patients suggest that this problem is far from a definitive solution.

Rapid decompression of bile ducts as the result of abrupt pressure reduction can lead to linear and volumetric blood flow reduction in the nearest hours after bile flow restoration, causing gross morphological damage to hepatocytes. There is data that rapid disappearance of significant jaundice leads to deterioration of patients in the first 4-5 days after bile ducts decompression [19].

In 1981 I.D. Prudkov described "fast decompression" syndrome, which is manifested by increased jaundice, worsened appetite, progressing hepatic encephalopathy and worsened results of liver, kidneys and other organs functional tests. To prevent "fast decompression" syndrome the so called dosed or fractional decompression was suggested to slow down the rate of bile outflow; studies by Galperin and Pikovsky (1966, 1968) showed that narrowing of NPV lumen up to 1-1.5 mm is enough for adequate bile drainage.

Cholangiography (CM) remains a useful method of assessing bile duct pressure. Traditionally *Heidenheim* (1868), *Doyon* (1893), *Herring* (1907), *Judd and Mann* (1917), *Archibald* (1919), *I.I. Orlov* (1935), *MacGonan* (1936), *Doubilet* (1937) and *Kolp* (1937) pioneered this method. In the USSR a significant contribution to the popularization of intraoperative cholangiography was made by *V.V. Vinogradov* and *D. Vinogradov*, as well as *D.L. Pikovsky*.

In 1937 *I.S. Radvin* and *V.D. Fralier* were the first to realize dose-dependent decompression of bile ducts [94]; in 1970s many researchers used cholecystogastric nasogastric tubes for this purpose, reducing postoperative mortality from 21.8% to 9.7% [21]. In the 1980s, new methods of slow and gentle reduction of pressure in the bile duct were developed. Some authors suggested to squeeze external drainage tube before its opening [32], some authors suggested to put or raise the end of drainage tube to a certain height [1], and some authors suggested to use small diameter tube or needle [33]. *M.E. Shor-Chudnovsky* suggested placing a fast-hardening mixture filler into the VLS [52]; it was assumed that after 12-16 hours the filler would slowly dissolve. Other authors suggested complex devices for bile duct decompression in patients with MJ syndrome that regulate bile duct pressure [37]. These methods are not widely used in clinical practice because of their complexity, the necessity to use non-mobile devices and inconvenience both for patients and medical personnel.

V.G. Ivshin et al. (1996) and *Y.I. Patutko et al.* (2000) recommend to perform biliary decompression during 4-28 hours depending on the dose [37]. At the same time the pressure drop in a bile duct must not exceed 10 mm of water column. After pressure decrease up to 160 mm a.c. this level must be maintained for 24 hours, after that spontaneous bile drainage must be carried out. With this approach, bile duct decompression in MI is an effective means of prophylaxis of BP in patients with MJ syndrome. It is also recommended to perform bile duct decompression by adjusting the catheter lumen. The simplest and the most available method is raising of the knee end of a BP to a certain height [29].

A.E. Borisov and N.I. Glushkov (1998) performed decompressive perfusion by injecting drugs into bile duct with two-channel drainage, simultaneously reducing

residual pressure in biliary tract to the same or slightly below the initial measurement [3].

I.I. Taranov (2000) suggested that in order to perform dosed decompression the external end of ABD should be bent as a knee and placed 16-18 cm above the level of the IVP. To gradually decrease the pressure in the tube, the width of bending of the external end of the tube is reduced by 1-2 cm daily [40].

Galperin E.I. et al. (2011) analyzed the results of biliary decompression in 185 patients with tumor MB, of whom 85 underwent NBD, 37 underwent CCF and 63 underwent cholecystostomy. To estimate the bile outflow rate, we studied the dynamics of serum biochemical indices and CMR results, and the dynamics of bilirubinemia during decompression was estimated according to T.S.A. Shimizu and K. Shimizu and the formula of K. Yoshida formula with the author's modifications. The results showed that the rate of decompression was slower with NDB and faster with CCF or cholecystectomy. Slower rate of bile drainage can significantly decrease the incidence of "rapid decompression" syndrome and such complications as increased liver dysfunction, organ failure and mortality after decompression [12].

A great number of works devoted to the experience of biliary calculi treatment in patients with obstructive jaundice in 1980s can be explained by wide use of ultrasound in clinical practice and access to bile ducts under its control G. Phillips et al. (1982), D. Matter et al. (1982) and Y.S. Xu et al. (1982) reported the success of percutaneous biliary tract intubation using ultrasound [83].

With the gradual development of technical support, the range of percutaneous interventions in the treatment of patients with MH syndrome expanded. Thus, in 1986 Z.S. Zavenyan et al. reported the success of antegrade papillosphincterotomy [103]; G.F. McNeely et al. (1986) and T. Soejima et al. (1986) reported percutaneous bilioduodenectomy in patients with biliary obstruction in VVC. results of percutaneous biliary duodenectomy [98].

Rapid development of surgical endoscopy the use of plastic biliary stents is justified in patients with malignant biliary tract diseases with a predicted survival rate less than 4 months, while the use of CMC is justified in patients with a predicted survival rate more than 4 months [89]. There is no significant difference in the duration of good functioning of covered and uncovered BMC in patients with bile duct tumor obstruction (Level of evidence: 1+). Endoscopic biliodenar stenting in patients before elective resection surgery is indicated when neoadjuvant therapy, acute cholangitis and severe pruritus are prescribed (GR: A). Early complications (postoperative pancreatitis, papillotomy bleeding) occur in 5% of cases and do not correlate with stent changes (level of evidence 1++). Late complications of biliary stenting directly depend on the type of endoprosthesis. Plastic stents often suffer from permeability, and acute cholecystitis and duodenal perforation are the most common complications with CMC (level of evidence: 1+). Approximately 5% of plastic and partially coated metal stents are prone to migration. Uncoated and fully coated stents have a similar incidence of 1% and 20% respectively (level of evidence: 1+) [65].

According to A.Z. Al-Bahrani et al. (2006), the incidence of stent migration is directly related to the previous stent placement for UTI. For example, distal stent migration after

EPST is 16% in 50 observations, and before EPST - 3% [56]. The potential life expectancy of modern plastic stents is 145.5 ± 32.4 days, CMC - 294 ± 35.8 days [96].

Based on the RCT comparing the use of coated and uncoated CMC in distal tumor blocks of the biliary system, C. Soderlund et al. (2006) found a significantly lower number of reoperations in patients with coated stents. This, in turn, significantly reduces the cost of treatment. Another advantage of coated stents is that they are practically free of hemophilia [97].

Conclusions:

Thus, it can be seen that the tactics of surgical treatment of patients with mechanical jaundice have changed significantly over the last decade, with minimally invasive biliary prostheses becoming the most popular. In addition, complex hybrid methods of treatment of benign biliary structures are increasingly being introduced.

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Aymagambetov M.Zh., Omarov N.B., Abdrakhmanov S.T., Ouenov M.Ə., Bulegenov T.A., and Akhmetzhanova D.O. - development of a literature review plan, text editing and approval of the final version of the article.

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