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# Acute cholangitis: Etiology, pathogenesis, classification, diagnosis and surgical tactics (Literature review)

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**Abstract**
According to the literature, modern data on the etiology, pathogenesis, clinic, diagnosis, treatment and prevention of acute cholangitis and biliary sepsis are analyzed in the complication of cholelithiasis. Acute purulent cholangitis and biliary sepsis are different manifestations of the infectious and inflammatory process that occurs locally and systemically. Postoperative lethality ranges from 13 to 60%. Many issues of pathogenesis, treatment and prevention of these pathological processes are not completely resolved and need further study.

**Keywords:** choledocholithiasis, acute cholangitis, detoxification, plasmapheresis

## Introduction

The frequency of purulent complications of inflammatory diseases of the biliary tract, despite the close attention of researchers to this problem, remains highly relevant. The inflammatory process in this localization is characterized not only by the local purulent-destructive process, but also by systemic disorders that quickly lead to severe endogenous intoxication and severe organ dysfunction. Such a condition is most often considered as a cholangitis, the severity of its morphological and clinical manifestations is very diverse [9, 24].

Mortality, according to various authors, is still high, reaching up to 30%. In the elderly, burdened with severe concomitant diseases, acute cholecystitis, complicated purulent cholangitis, represents the most difficult problem diagnosis and treatment [12, 18]. In this case, choledocholithiasis in combination with stenosis of the terminal section of choledoch causes the most severe violation of bile passage and is the most common cause of purulent cholangitis [17, 26].

Often, the cause of obstruction can also be benign stricture of the bile duct and stricture of the biliodigestive anastomosis [18, 33].

Cholangitis can act as a complication of reconstructive operations on the bile ducts, for example, when applying an anastomosis of choledochus or a common hepatic duct with a small intestine with an insufficiently wide opening or with the development of cicatricial stenosis of the anastomosis [2, 3, 7, 9, 21]. The cause of cholangitis can also be internal biliary fistula - in most patients with Mirizzi syndrome, cholangitis is detected [19, 27].

After analyzing the results of surgical treatment of 56 patients with chronic obstructive pulmonary disease, complicated Mirizzi syndrome, Z.B. Kurbaniyazov *et al*. (2011) offer a differentiated treatment approach depending on the type of this pathology and the nature of the inflammatory process of the bile duct [32].

According to the ideas of other authors, the other way getting bacteria in the bile - it is their arrival is, in the portal circulation from the small intestine. Normally, these bacteria maintain a certain tone of the body's immune system due to the reaction of intestinal lymph nodes and fixed liver macrophages to them [2, 12, 18].

When the pressure is raised to 300 - 450 mm. water. art. there is cholangiogenic and cholangiolymphatic reflux, as a result of which bacteria and endotoxin from the infected bile enters the systemic circulation. Also, with cholestasis, the function of Kupffer cells is disrupted and their phagocytic activity decreases. Against this background, when the syndrome of achiolia develops, the permeability of the intestinal wall increases for bacteria and endotoxin, and their concentration increases in the blood of the portal vein [7, 12, 18, 21].

Thus, in two ways - through the biliary system and through the portal vein - endotoxin and bacteria enter the central vein of the sinusoid, from where they enter the central bloodstream. This causes the development of an immune reaction, accompanied by the release of cytokines, prostaglandins, peptides with vasoactive properties and causing a characteristic vascular and general reaction.

There is no single generally accepted classification of cholangitis to date [2, 4, 18]. However, most authors adhere to the following division of purulent cholangitis: three forms of purulent cholangitis - acute, acute recurrent and chronic [1, 26]. Since most often the course of the disease is caused by purulent complications, they distinguish purulent cholangitis without purulent complications with septicemia and septicopyemia. The following forms of purulent cholangitis are distinguished from the degree of lesion of the liver parenchyma: with lesion of the liver parenchyma, with pericholangitis, with lesion of portal tracts, biliary cirrhosis of the liver. By the nature of inflammation, catarrhal, purulent, fibrotic, fibro-purulent, fibro-ulcerative, gangrenous cholangitis is isolated. By type of causative agent, cholangitis can be aerobic, anaerobic and mixed. According to the clinical course, the following forms of cholangitis are suggested: 1. acute cholangitis with a favorable course; 2. Acute purulent cholangitis; 3. septic form of acute cholangitis; 4. chronic cholangitis with subclinical course; 5. chronic cholangitis with

septic course [2, 18, 26].

The results of treatment of diseases complicated by the onset of purulent cholangitis primarily depend on the timely and accurate diagnosis of the nature of jaundice, the level and cause of obstruction of the bile duct [32]. So y a number of patients with purulent cholangitis initially develop severe CNS disorders, and the classical triad Charcot manifested itself in later terms of the disease. Sometimes there is no pronounced temperature reaction, no leukocytosis, and the operation is difficult cholangitis with multiple liver abscesses. There are cases when acute purulent cholangitis stimulated such diseases of the abdominal cavity organs as acute cholecystitis, acute pancreatitis, perforated ulcer of the stomach and duodenum. The diagnosis does not cause doubt only in those cases when its clinical manifestations are objectively confirmed by complete obstruction of the bile ducts [5, 29].

Along with the characteristic clinical picture of the disease, an important role in the diagnosis of acute cholangitis belongs to a number of biochemical parameters of blood serum (total bilirubin and its fractions, ALAT, ASAT, alkaline phosphatase, gamma-glutamyltranspeptidase, etc.) [3, 14]. In the laboratory study of peripheral blood, pronounced leukocytosis with a leftward shift, thrombocytopenia, a high degree of ESR increase, anemia increases. Bilirubin in acute purulent cholangitis is usually in the range of 85 - 120 μmol / L, but occasionally there is hyperbilirubinemia up to 300 μmol / l, which usually indicates the severity of purulent cholangitis. There is always an increase in the activity of alkaline phosphatase [27].

The frequency of bacteremia is 40 - 60%. With a positive result of blood culture, the isolated flora coincides with strains obtained from bile. Bacteriobiology occurs in 85 - 100% of cases, with more often (60-70%) in the association of microorganisms, less often (15-25%) in the form of monoculture [2, 12, 17, 21].

The introduction of fistuloholangioscopy (FHS) into surgical practice significantly expanded the understanding of the incidence, severity and prevalence of cholangitis. FHS allowed to diagnose cholangitis in 74.1%. FHS has shown that it is the most effective way to determine the nature and extent of the pathological process in the biliary tract with cholangitis. This technique in patients with cholangitis in addition to clarifying the cause of mechanical jaundice allows you to visually assess the contents of choledoch and take the material for examination. In addition, its carrying out is very effective means of sanitizing the bile ducts by washing them with solutions containing antibiotics, which provided a mechanical removal of pus and the delivery of antibiotics to the focus of inflammation. [8, 10, 15, 21].

Instrumental methods of investigation (ultrasound, endoscopic ultrasound, ERCPG, computed tomography, magnetic resonance cholangiography, intraoperative cholangiography, etc.) are the final stage in the diagnosis of pathological changes in hepaticocholedoch and allow the detection of concretions of the common bile duct with sufficient accuracy [10, 18, 21, 32]. Ultrasound examination in patients with cholangitis is aimed at identifying signs of bile hypertension, determining the level of the cause of obstruction of the billiard tree, diagnosis of concomitant pathology of the liver and gallbladder. Informativeness of ultrasound in identifying the form of cholecystitis, cholecystolithiasis and signs of bile hypertension is close to 100%. The ability of the method to determine the level and cause of obstruction of the biliary tract is from 22 to 88% [2, 8, 18]. Ultrasound as non-invasive, fast-performing and easily tolerated by patients is suggested to be used in all patients with suspected purulent cholangitis. Signs of cholangitis in ultrasound - a thickening of the wall of choledoch, the presence in its lumen of a parietal sediment and echopositive inclusions ranging in size from 2 to5 mm without acoustic shade (flakes of pus, fibrin films, putty) are determined in no more than 18% of cases. Together with the stress tests, it is possible to determine the functional state of the hepatic tissue and its reserve capabilities in combination with the test samples [29, 37].

Computer tomography is a highly informative noninvasive method for diagnosing liver, bile duct and pancreas pathology. With its help, you can determine the biliary hypertension and clarify the cause of obstruction of the biliary tract. Unexpended intrahepatic bile ducts with computed tomography on "native scans" are not normally visible. However, KT has a number of drawbacks. These include: the need for X-ray exposure, invasiveness due to the need for intravenous or intra-arterial administration of contrast agents; limited use in patients with allergic reactions to iodine (use of iodine-containing contrast agents); the presence of a "step" of the tomograph makes the procedure dependent on the choice of the program; the impossibility of characterizing the motion and pulsation of structures. This method is of special value in the detection of cholangiogenic liver abscesses [18, 24]. Available single reports on the use of spiral computed tomography in the diagnosis of extrahepatic biliary tracts special advantages of this method over the conventional CT technique have not been revealed [36].

Magnetic resonance imaging (MRI) is a new technique for visualization of bile and pancreatic ducts. MRI provides a high degree of reliability in the diagnosis of surgical diseases of the liver, biliary tract and pancreas, it makes it possible to determine the level of the extent, the cause of obstruction, and to assess the nature of the contents of the intrahepatic bile ducts (sludge wall mass, flakes). The possibility of constructing a three-dimensional image of the bile ducts and ascertaining their relationship to the portal system, makes it possible to determine the safe access and the type of decompression of the biliary tract [4, 26, 34]. The informativeness of this method is comparable to computed tomography, but it has several advantages over it: noninvasiveness, harmlessness (no radiation load), three-dimensional image acquisition, natural contrast from moving blood, lack of artifacts from bone tissue, high soft tissue differentiation, possibility performance of MP-spectroscopy for in vivo intravital study of tissue metabolism. With choledocholithiasis, as the main cause of purulent cholangitis, the sensitivity and specificity of MRI is 81-98%. Its use is limited by the impossibility, the reliable detection of calcite stones, the relatively high cost of equipment, the impossibility of examining patients with artificial pacemakers, large metal implants [23, 30].

The leading role in establishing the flow of bile causes disturbances in patients with obstructive jaundice and cholangitis attached methods direct contrast biliary tract, such as percutaneous transhepatic cholangiography, endoscopic

retrograde cholangiography-pancreatic [11, 32]. Endoscopic retrograde pancreatocholangiography (ERPHG) was most prevalent in choledocholithiasis, which is primarily due to the possibility of completing the study with therapeutic manipulations of endoscopic papillosphincterotomy, nasobiliary drainage, and biliary endoprosthetics. With a visual examination of the duodenal mucosa and the falcon nipple, a characteristic feature of acute cholangitis is an increase in the size of the large duodenal nipple, hyperemia of the mouth, a thickening of the villi surrounding it, and pus or turbid bile with an admixture of fibrin and detritus entering the duodenum. Various water-soluble X-ray contrast preparations are used for ERPHG: verographene, urographine, angiography, trazograph, etc. [14, 31]. The main indicators for conducting ERPHG are the presence of pancreatic and bile duct diseases and their complications in the patient. X-ray signs of acute cholangitis have been identified. These include: erasure, blurring and the usurpation of the contours of the bile ducts and filling defects. The most convincing are when using highly concentrated solutions of contrast media. With the help of ERPHG it is possible to establish the etiology of purulent cholangitis and the level of the choledoch block. The informative value of ERPHG in diagnosing "benign" diseases of extrahepatic biliary tracts is from 80 to 95% [21, 37, 38].

However, the use of ERPHG with purulent cholangitis is dangerous if, before or after it, the decompression of the biliary tract is not performed (endoscopic papillosficterotomy or nasobiliary drainage). Without decompression after ERCP, the inflammatory process in the biliary tract becomes aggravated, becoming unmanageable. In addition, each ERPHG, in order to prevent ascending cholangitis and sepsis, should be accompanied by antibiotic prophylaxis, with most authors giving antibiotics to the fluoroquinolone groups [8, 21, 37].

Percutaneous transhepatic cholangiography (CGI) was first proposed in 1952 by Carter R.F. and Saypol G.M. by percutaneous transhepatic puncture of the bile ducts. There are different opinions about the expediency of its appointment. Some authors believe that this method is difficult to perform in patients with sepsis and even contraindicated, since an increase in pressure in the bile ducts contributes to the dissemination of bacteria, the development of septicemia, and sometimes provokes a septic shock; others associate a successful application with the possibility of achieving maximum aspiration of the purulent contents of the bile ducts, before and after contrasting, performing decompression of the biliary tract [2, 8, 18, 21]. To prevent possible complications and get good results, special technical equipment is needed: an angiographic unit equipped with X-ray and a magnetic recording of the means for transhepatic endobiliary interventions. It is possible to obtain a contrast of the ducts of 85-100% of cases, a complication in this study is noted in 3-4% of cases. The use of HFHC makes it possible to determine the nature of jaundice and to accurately determine the level of obstruction of the bile ducts [15, 21, 32].

Currently, the unsatisfactory results of surgical treatment of purulent cholangitis are due to the complexity of determining therapeutic tactics, which includes two main factors: on the one hand, progressive liver failure and endotoxicosis require immediate surgery to decompress the biliary tract, on the other, pronounced multiple organ failure significantly increases the degree of operational risk when performing radical interventions, which makes it necessary to conduct an intensive the correction of functional and metabolic disorders and targeted antibiotic therapy [2].

A differentiated approach to treatment of purulent cholangitis. Misnik *et al*. (2009). determined depending on the nature of the process and the severity of endotoxicosis. The authors believe that the decompression of the biliary tract and subsequent sanation is of paramount importance, since tissue hemoperfusion of the liver improves after decompression, the basal blood flow in the portal vein increases, the functional liver reserve, the increased supply of endotoxin to the bloodstream ceases, and optimal conditions for restoring the impaired liver function are created, other organs and systems [29, 31].

Despite the high level of surgical techniques, anesthesia and resuscitation, traditional operations represent a serious trauma for patients, cause a violation of topographic and anatomical relationships between organs, leading to functional and organic disorders. In addition, they are accompanied by a large number of complications and high mortality, especially in patients of older age groups with severe concomitant pathology [7, 13, 35].

The widespread introduction of new tactical and technological schemes into clinical practice, using sparing methods of decompression and sanitation of the biliary tract, significantly improved the results of treatment of patients with purulent cholangitis [15, 34].

The advantage of minimally invasive surgical technologies is the combination of high diagnostic and therapeutic efficacy with low traumatism, as well as the rapid acquisition of the "clinical benefit" effect (reduction of functional disorders, improvement of health status, decrease in the intensity of pain syndrome and weight gain).

Indications for the use of this or that decompression method must be established strictly individually, depending on the clinical situation, the nature, level and extent of the obstruction of the outflow of bile, taking into account the results of direct radiopaque studies of the biliary tract [2, 36].

Modern minimally invasive technological methods for the recovery of cholerotosis are divided into endoscopic retrograde, percutaneous-transhepatic, operations from mini-access or video endoscopically [5, 26].

The most expedient is carrying out endoscopic methods of bile excretion in cholangiolithiasis (especially choledocholithiasis) and lesions of the terminal section of the common bile duct. ERPHG precedes all endoscopic methods of choleresis. Its high diagnostic efficiency is advantageously combined with the possibility of performing therapeutic procedures (papillosphincterotomy, lithotriction and lithotripsy, nasopharyngeal drainage, sanation of bile ducts, installation of endoprostheses, etc.). The therapeutic and diagnostic efficiency of ERPHG is largely dependent on the skill level of the specialist and reaches 90% [7, 35].

In most cases, the study ends with endoscopic papillosphincterotomy or supraduodenal choledochoduodenostomy, which is less beneficial. Papillosphincterotomy is the method of choice for 75-86% of patients with purulent cholangitis, sporting against

cholangiolithiasis and mechanical jaundice. This procedure is relatively safe even in patients of older age groups with severe concomitant diseases (complication rates in leading clinics do not exceed 5-7%, and lethality - 0.5%) [18].

Nasibiliary drainage by a thin catheter is usually the final stage of endoscopic interventions. The wide possibilities of nasobiliary drainage allowed to increase the effectiveness of endoscopic methods of treatment and to reduce the number of possible complications. Nasobiliary drainage is of great importance for the endoprosthesis, the treatment of the external biliary fistula and cholangiogenic abscesses, the aspiration of bile for biochemical, cytological and bacteriological studies, as well as temporary drainage of the bile ducts with the impossibility of endoprosthetics [23].

Percutaneous transhepatic cholangiostomy (PTCS) was first described by C.S. Weichel in 1964 and has since been treated as a way of decompressing the biliary tract before surgical intervention. It should only be remembered that this procedure itself can be a source of complications like sepsis and endotoxic shock. With the introduction of the test for endotoxin it has been revealed that after PTCS endotoxemia in patients is observed, which was associated with an increase in pressure and intraductal bilio venous reflux with contrasting ducts [4, 15]. This method has the advantage over other methods and is that the movement of the puncture needle can be observed in real time and in relation to the vessels and ducts of the liver. This method eliminates the need for prior percutaneous contrast of the ducts with an increase in intra-flow pressure and the risk of developing biliovenous reflux with endotoxemia [4, 30].

With the help of percutaneous transhepatic cholangiostomy, both external bile and external drainage are possible, when drainage is below an obstruction or transpapillary. With intrahepatic stenosis and lythiasis, which causes biliary sepsis, the method of choice is PTCS. After holangiostomu may conduct balloon dilatation of strictures and laser ultrasonic lithotripsy fibro choledochoscopy with intraductal manipulation [14, 21, 38].

Often patients after emergency decompression beat and a tract radical operation is performed with the use of minimally invasive technologies: cholecystectomy, choledochoduodenostomy, or holetsistoduodenostomiya, enterocholecystostomy or, in rarer cases - holetsistogastrostomiya. In some cases, external drainage of the biliary tract with the use of minimally invasive technology and without it was the final method of treatment. Basically, these are patients with oncological and severe concomitant diseases [2, 34].

Often patients enter the clinic in serious condition after a number of repeated operations, caused by mechanical jaundice, cholangitis, secondary biliary cirrhosis, portal hypertension. At examination in such patients high-tibial strictures of the bile ducts are revealed, due to traumatic injury of them during repeated repeated operations, and stricture of bioliodigestive anastomosis [8, 25, 31].

In those cases when the patients had cicatrical narrowing of the biliodigestive anastomosis, recanalization of the anastomosis followed by transhepatic drainage is performed. With cicatricial narrowing of the ducts, the operation is completed by the creation of a biliodigestive anastomosis with transhepatic drainage [3, 34].

The surgeon with high occlusion of the bile ducts has to decide the issue when to make one-sided and bilateral drainage. There is an opinion that in those cases when the duodenum or the loop of the small intestine is anastomosed with the stump of the common bile duct, one-sided transhepatic drainage is sufficient. Two-sided transhepatic drainage is indicated with scar scarring or damage at the level of bifurcation of the hepatic ducts and proximal to it. The proximal and distal ends of transhepatic drainages are projected outward. When anastomosis is performed between the bile ducts and the 12-colon, the distal ends of the transhepatic drainage are discharged through the microhistrosis. If the loop of the small intestine participates in the formation of the bioliodigestive anastomosis, the distal end of the transhepatic drainage is excreted through the microenterosterum [3, 18, 21].

One of the most important problems in the treatment of cholangitis is the choice of adequate antibiotic therapy. After decompression, antibiotic therapy plays an auxiliary role. However, complete sterility of the bile (when harvesting from the T-drainage) cannot be achieved. In addition, it has been established that, without antibiotic therapy, the titer of microbial bodies in bile does not decrease after decompression. Considering the fact that with external drainage the bacterial flora changes, the determination of the number of microorganisms in bile is considered laborious and impractical [7].

After endoscopic retrograde cholangiopancreatography, cholangitis occurs in 0.8%, after percutaneously transhepatic cholangiography - in 1% of cases, and bacteremia - in 2.5%. Addition of antibiotics to the contrast agent does not, so prophylactic intravenous antibiotics are recommended before endoscopic and endobiliary interventions [8, 9, 18, 28].

Factors affecting the excretion of antibiotics in bile are the molecular weight of the drug, its polarity, metabolism in the liver. The role of each of these factors is not specified and there are no absolute rules. Meanwhile, it has been established that antibiotics with a molecular weight below 500-600 in the bile come with difficulty and are mainly excreted in the urine. Thus, rifamid (molecular weight 8110) and erythromycin (molecular weight 734) are excreted well in bile, and cycloserine (molecular weight 102) is not secreted, although oxygenation changes the polarity of fat-soluble antibiotics, and the formation of their glucuronide increases the molecular weight [18, 23].

Most authors recommend initiating therapy with acute obstructive cholangitis before receiving data from a study of sensitivity to antibiotics using ureidopenicillin (mezlocillin O and cephalosporins (cefotaxime) [3, 25].

Purposeful detoxification is indicated for patients with moderate to severe purulent intoxication. And the effectiveness of detoxification depends on the completeness of decompression of the biliary tract. Detoxification performed before the operation gives a short effect [4, 12].

Based on the assumption that endotoxemia is at the basis of the main complications of mechanical jaundice (renal failure, coagulation disorders, gastrointestinal bleeding, wound healing disorders), the opinion was expressed that endotoxin is introduced into the intestinal tract before the operation inward.

Bile acids prevent the development of kidney failure, delay the growth of gram-negative flora. Dihydroxy fatty acids, dioxycholate and chenodeoxycholate, have the greatest anti-endotoxic effect.

An important role is occupied aspects of intensive care: nutritional support, immune substitution therapy, correction of blood coagulation and the prophylaxis of deep vein thrombosis and thromboembolic complications, prevention of stress - ulcer and the occurrence of gastrointestinal bleeding in patients with sepsis [2, 16, 18].

Infusion therapy belongs to the initial measures to support hemodynamics and, above all, cardiac output. The main tasks of infusion therapy in patients with cholemic endotoxicosis are: restoration of adequate tissue perfusion, normalization of cellular metabolism, correction of hemostasis disorders, decrease in the concentration of mediators of the septic cascade and toxic metabolites. With biliary sepsis with multiple organ failure and septic shock, it is necessary to strive for rapid achievement (the first 6 hours after admission) of the target values of the following parameters: CVP 8 - 12 mm Hg, blood pressure more 65 mmHg, diuresis 0.5 ml / kg / h, hematocrit more than 30%, blood saturation in the superior vena cava or atrial right of at least 70%. The use of this algorithm improves survival in septic shock and severe sepsis. For infusion therapy, within the framework of targeted intensive therapy of sepsis and septic shock, crystalloid and colloidal infusion solutions are used with practically the same result. Low perfusion pressure requires immediate inclusion of drugs that increase vascular tone and inotropic cardiac function. Dopamine and norepinephrine are the first-choice drugs for correcting hypotension in patients with septic shock [18, 29, 36].

The development of the syndrome of multiple organ failure in sepsis, as a rule, is accompanied by the manifestation of hypermetabolism. In this situation, the coverage of energy needs is due to the destruction of its own cellular structures, which aggravates the existing organ dysfunction and enhances endotoxicosis. Therefore, carrying out artificial nutritional support is an extremely important component of treatment and is included in the complex of compulsory medical measures. The inclusion of enteral nutrition in the intensive care complex prevents the translocation of microflora from the intestine, the development of dysbacteriosis, increases the functional activity of the enterocyte and the protective properties of the mucous membrane, reducing the degree of endotoxicosis and the risk of secondary infectious complications [16, 19].

An important aspect of complex intensive therapy for severe sepsis is the constant monitoring of the level of glycemia and insulin therapy. It is necessary to strive to maintain the level of glycemia in the range of 4.5 - 6.1 mmol / l. When the level of glycemia over 6,1mmol / l insulin infusion should be conducted (at 0.5 - 1 U / hr) to maintain normoglycemia (4.4 - 6.1 mmol / l) [3, 14].

Disturbance of kidney function in the syndrome of multiple organ failure leads to rapid decompensation of organ failure due to the increase in endotoxemia due to the development of the syndrome of systemic inflammatory reaction, massive cytolysis, pathological proteinolysis leading to the development of severe water-sectoral disorders with generalized endothelial damage, hemocoagulation and fibrinolysis, increased permeability of capillary and, as a result, rapid decompensation of organ failure [1, 18].

In recent years, extracorporal methods of detoxifying the body have become increasingly popular for the active removal of toxic substances from the bloodstream and tissue stores. In-portal administration of medicinal products, exchange blood transfusion, plasmapheresis, hemodialysis and peritoneal dialysis, lymphatic methods are suggested. The effectiveness of each of them is discussed to the present time, as often the number of complications in their use exceeds the benefits. In particular, the widespread use of arterialisation in practice portal blood, cross circulation, exchange blood transfusion and some others, which is associated with both the technical difficulties in carrying out the techniques and the danger of developing formidable complications. The bulk of toxic substances accumulating in the blood during hepatic dysfunctions is associated with blood plasma proteins, in particular with albumins, but a number of substances (ammonia, creatinine) with proteins are not bound and are water soluble [11, 26, 30]. Proceeding from this, the method of purification of blood in case of liver failure should meet the following requirements:

- Ensure the excretion of protein-bound and water-soluble toxins;
- Maintain in the norm the indicators of acid-base and electrolyte balance;
- Maintain the effectiveness of the procedure for a long time;
- Cause a minimal number of side effects and complications.

Plasmapheresis is the most effective and pathogenetically grounded method, in which endotoxin accumulated in plasma, cytokines, active peptides, circulating immunocomplexes and their metabolic products are removed [12, 37].

Plasmapheresis - plasm (blood plasma) + aphairesis (ablation or removal) is the method of extracorporeal hemocorrection, based on the replacement of blood plasma of the patient with components, blood preparations and blood substitutes. Depending on the method of obtaining plasma, the apparatus, centrifugal, membrane and sedimentation (settling) method of plasmapheresis is isolated. During plasmapheresis, a portion of blood is withdrawn from the body into the system, into the vial, into the blood container, which then, depending on the method, is divided into plasma and uniform elements (blood cells - red blood cells, white blood cells, platelets (cells participating in the process of blood coagulation), blood cells return to the body, and the removed plasma, depending on whether the therapeutic is plasmapheresis or donor, is utilized or used for transfusion or for the production of blood components or preparations. If the plasma is subjected to other methods of action, such as cold and returns, then t kai procedure called krioferez. Analysis of publications on the use of plasmapheresis in hepatic failure and mechanical jaundice, testifies to the high efficiency of the method and the wide possibilities of its use in clinical practice. The authors noted improvement in the patients' condition, a decrease in the signs of cholemic intoxication, a reduction in the phenomena of hepatocerebral insufficiency confirmed by an objective reduction in the level of bilirubin of blood, a concentration of medium molecules, a decrease in the activity of transaminases

and alkaline phosphatase [11, 16, 29].

The use of plasmapheresis in mechanical jaundice caused by choledocholithiasis, according to many authors, has a pronounced detoxification effect that improves the prognosis of treatment. But along with this, there are still many questions concerning the number of plasmapheresis sessions in the preoperative and postoperative periods, the state of the immune and antioxidant system of the body with mechanical jaundice. However, the main problem remains adequate replacement of the exfused plasma with protein components. In addition, when transfusion of the donor plasma, there is a risk of possible immune reactions, the risk of infection of the patient with hepatitis B and C viruses, human immunodeficiency virus, cytomegalovirus, herpes virus, etc. [7, 36].

Proceeding from the above, improving the methods of detoxification of patients with purulent cholangitis is relevant. The use of regenerated autoplasma to a minimum will reduce the need for donor protein preparations, reduce the risk of possible immune and transfusion reactions, the risk of infection of the patient with hepatitis B and C viruses, human immunodeficiency virus, cytomegalovirus, herpes virus, etc.

Thus, summarizing the foregoing, the specific tasks of treating acute cholangitis and biliary sepsis are: emergency minimally invasive decompression of the bile ducts, which eliminates the source of infection, adequate antibacterial therapy, hemodynamic and respiratory support, immunocorrection, nutritional support, and extracorporeal detoxification methods.

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