

# Optimization of Tactical and Technical Aspects of Complex Surgical Treatment of Acute Purulent Cholangitis

Shonazarov Iskandar Shonazarovich

Samarkand State Medical University, Uzbekistan

**Abstract** The results of surgical treatment of 144 patients with acute purulent cholangitis were analyzed. Trans drainage sanitation of the biliary tract with 0.06% anolyte and catholyte solutions of sodium hypochlorite promotes early eradication of bile microbial contamination, normalization of bilirubin, Aspartate aminotransferase (AsAT) and alkaline phosphatase activity, increases bile secretion by more than 2 times. Optimization of the tactical and technical aspects of the complex surgical treatment of acute purulent cholangitis as a complication of cholelithiasis contributed to the improvement of treatment results due to early relief of cholangitis, prevention of liver abscesses and the development of biliary sepsis. At the same time, a decrease in postoperative septic and cholemic complications was decreased from 24.5% to 12.1%, mortality from 8.2% to 2.4%.

**Keywords** Cholelithiasis, Acute purulent cholangitis, Surgical tactics

## 1. Introduction

According to the World Health Organization, "... the frequency of purulent complications of inflammatory diseases of the biliary tract occurs in 46% of cases and, despite the close attention of researchers to this problem, remains highly relevant..." The inflammatory process in this localization is characterized not only by a local purulent-destructive process, but also by systemic disorders that contribute to the rapid development of severe endogenous intoxication and severe organ dysfunction. This condition is most often interpreted as cholangitis, the severity of morpho functional and clinical manifestations of which is very diverse. In the development of purulent cholangitis, a violation of the patency of the bile ducts, especially due to cholelithiasis, infection of the bile and the development of inflammation and hypertension, is of decisive importance. In 87% of patients, signs of obstructive jaundice immediately appear, and subsequently the phenomena of endotoxemia join with the development of biliary sepsis and multiple organ dysfunction. insufficiency in dynamics (explain) [1,3,9,12].

The main trend in the treatment of patients with purulent cholangitis throughout the world is early decompression of the bile ducts, with the administration of antibiotics, given

the sensitivity of the bile microflora, as well as detoxification therapy (plasmapheresis). In accordance with the rules, surgical treatment of patients with purulent cholangitis is carried out in the following sequence. At the first stage, decompression of the bile ducts is performed using low-traumatic methods: endoscopic papillosphincterotomy with the installation of nasobiliary drainage or percutaneous transhepatic drainage [2,4,7,13]. At the second stage, patients undergo removal of the gallbladder by laparoscopic or minilaporal access with external drainage of the hepaticocoledochus. In 36.0-55.5% of cases, patients need to perform simultaneous operations by laparotomic access due to the presence of phlegmonous and gangrenous forms of inflammation of the gallbladder with perivesical infiltrate or local peritonitis or bilioduodenal fistula. However, in numerous studies, the results of surgical treatment explain; in 20% of cases, patients develop a septic condition, resulting in death from 6.25% to 30.0% of cases [5,6,8,10].

## 2. The Aim of the Study

To improve the results of complex surgical treatment of patients with benign acute purulent cholangitis by optimizing tactical and technical aspects.

## 3. Material and Research Methods

Article presents the results of treatment of 144 patients with purulent cholangitis, which developed as a

\* Corresponding author:

sammi-xirurgiya@yandex.com (Shonazarov Iskandar Shonazarovich)

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complication of cholelithiasis (GSD), who were treated in the period from 2000 to 2021. Of these, 91 women (63.2%) and 53 men (36.8%) aged 33 to 81 years. The mean age of the patients was  $53.2 \pm 6.2$  years.

The duration of the disease of the biliary system in 112 (78%) patients was more than 5 years. 73.6 % i.e., 3/4 of the patients were hospitalized more than three days after the onset of the disease. The duration of cholangitis up to 3 days occurred in 38 patients (26.4%), from 3 to 7 days - in 78 (54.2%), and more than 7 days - in 38 (26.4%) cases.

The first days of an attack of acute cholangitis were characterized by pain in the right hypochondrium and epigastrium (89.9%), while after 4 days or more from the onset of the attack, the number of patients complaining of pain was much less (67, 3%), but at the same time, the number of patients with purulent-inflammatory complications of cholangitis increased (83.6%).

Acute purulent cholangitis as a complication of cholelithiasis developed due to choledocholithiasis and chronic calculous cholecystitis in 82 (56.9%) patients, acute calculous cholecystitis and choledocholithiasis in 62 (43.1%) patients, and acute destructive cholecystitis was complicated by various forms of peritonitis in 29 patients (spilled 7, local 22).

OHC expand was diagnosed on the basis of the clinical picture (Charcot's triad, pentad Reynolds), laboratory and instrumental research methods (sonography, RPCH, MR-cholangiography). The final diagnosis was established by the characteristic changes in the walls of the bile ducts and bile with the determination of the microflora.

## 4. Results and Its Discussion

The comparison group consisted of 61 (42.4%) patients who in the period 2000-2009. operated on for acute purulent cholangitis as a complication of cholelithiasis. The main study group consisted of 83 (57.6%) patients who received surgical treatment developed in the clinic in the period from 2010 to 2021. In the study, both groups of patients were identical both in age and in the severity of clinical manifestations and the severity of the disease.

Factor analysis showed that the main reason for the unsatisfactory results of surgical treatment of patients with AHC in the period 2000-2009 was. were cholangiogenic liver abscesses and biliary sepsis. Mortality was 8.2% (5 patients died). Various purulent-septic complications in the postoperative period were observed in 15 patients (24.6%). In all operated 61 patients, surgical intervention consisted of performing CE with choledocholithotomy with external drainage of the choledochus, and surgery was performed through a wide laparotomic approach in 48 (79 %), from a mini -access - in 13 (21%).

At the same time, CE with choledocholithotomy for emergency indications (within 2-3 hours from admission to the hospital) was performed in 29 (47.5%) patients due to acute destructive cholecystitis, and in 12 patients with

complication of destructive cholecystitis with peritonitis. Also, 6 patients underwent surgery for emergency indications in the presence of a clinic of acute obstruction of the main bile ducts.

According to urgent indications (within the next 2-3 days), 32 (56%) patients were operated on in whom the clinic of obstruction of the common bile duct prevailed in the absence of a clinic of destructive cholecystitis.

At the same time, emergency operations (12.1% and 33.3%) with a combination of AHC with acute destructive cholecystitis and peritonitis (14.8% and 44.4%, respectively) gave the highest percentage of deaths and purulent-septic complications.

In the main group of 83 patients operated on in 2010-2019. regarding AHC as a complication of cholelithiasis, treatment was carried out taking into account the severity of AHC proposed at the conciliation conference in Tokyo (2006). In accordance with these criteria, mild severity of AHC was found in 54 (65%) patients, moderate in 18 (21.6%), and severe in 11 (13.2%) patients.

Patients with AHC were subjected to various minimally invasive and open surgical interventions, considering the proposed severity criteria, as well as the presence of a clinic of acute destructive cholecystitis and peritonitis.

In the main group, in patients with moderate severity ( $n=18$ ) and severe AHC ( $n=11$ ), the first stage of treatment in 20 patients was the use of minimally invasive decompressive interventions.

At the same time, in 9 patients with acute destructive cholecystitis, gallbladder decompression was performed using percutaneous transhepatic microcholecystostomy (CCMCS) under ultrasound control. Then, 5 of them underwent endoscopic papillosphincterotomy (EPST) and nasobiliary drainage (NBD). In the remaining 4 patients, PTCS significantly stopped the clinical manifestations of AHC. In 11 patients with AHC without a clinic of acute cholecystitis, the first stage was endoscopic trans duodenal interventions of EPST with lithoextraction and NBD of the choledochus. At the second stage, these 20 patients underwent cholecystectomy-LChE-13, MLChE-7 on days 7-12, while in 4 MLChE it was supplemented with choledocholithotomy.

In 4 patients with a peritonitis clinic, according to emergency indications, laparotomy, CE, choledocholithotomy and sanitation of the abdominal cavity were performed. Another 5 patients with a progressive clinic of AHC, with an unsuccessful attempt at EPST, underwent CE with choledocholithotomy from an open mini-access.

Thus, two-stage surgical treatment was performed in 11 (61.1%) patients with moderate severity and 9 (81.8%) with severe AHC.

In mild OHC, two-stage surgical treatment was performed in 13 (24.1%) patients, one-stage radical surgery was performed in 41 patients.

In total, 18 (21.7%) patients of the main study group underwent PTCS in the surgical treatment of patients with AHC. Drainage of the gallbladder under ultrasound control

was performed through the area of the liver parenchyma in order to seal the canal and prevent leakage of bile into the abdominal cavity.

Drainage in all cases was performed with an "umbrella" stylet - a catheter with a "basket" at the end, catheter diameter 4F and 9F.

After performing microcholecystostomy, the contents of the gallbladder were completely evacuated, its cavity was washed with saline to a clean discharge, and the drainage was lengthened. The drainage discharge was assessed visually and sent for bacteriological examination. The completeness of the emptying of the gallbladder cavity was monitored echographically.

In the main study group, only 27 patients were performed with OHC EPST. At the same time, 15 patients with AHC without a clinic of destructive cholecystitis underwent EPST and NBD at the first stage. In 12 patients with a prevalence of acute destructive cholecystitis, this intervention was performed after PTCS. At the same time, it should be noted that in 9 patients with AHC, attempts at EPST and installation of NBD were unsuccessful, and in one case, the patient developed acute pancreatitis with a fatal outcome.

Thus, 2-stage surgical treatment was performed in 33 patients of the main group, which amounted to 39.7%. These patients, after a preliminary minimally invasive decompression of the biliary tract, underwent CE at the second stage on days 7-12, with 22 - LCE, 11 - MLCE, and in 6 of them, MLCE was supplemented with choledocholithotomy.

In 50 (60.3%) patients of the main study group, a radical operation - CE and choledocholithotomy was performed both from a wide laparotomic approach in 17 patients with a combination of ACH with acute destructive cholecystitis and peritonitis, and from a minilaparotomic approach in 33 patients.

LCE was carried out using the instruments of the firm "Karl Storz", CE from mini-access with the tools of the SUN company. Thus, LC was performed in 22 (26.5%) patients, CE from mini-access 44 (53%), CE from wide laparotomy access 17 (20.5%).

In order to stop inflammation in the bile ducts and prevent the formation of microabscesses or abscesses in the liver, these patients underwent sanitation perfusion of the biliary tract with 0.06% sodium hypochlorite solution developed by us. Intrabiliary sanitation was carried out through drainage tubes installed in the hepaticocholedochus (HC) after choledocholithotomy in 56 patients and NBD in 27 patients.

After choledocholithotomy, 2 paired tubes were installed in the lumen of the choledochus, one of which (thin in the lumen diameter 2 mm) in the direction of the proximal end of the GC, the second (with a wider lumen up to 4 mm) in the distal direction of the GC.

Sanitary perfusion of the biliary tract on the first day was carried out with 400.0 ml of an anolyte 0.06% sodium hypochlorite solution with pH = 6 until the bile microflora was normalized. The anolyte solution of sodium hypochlorite, being a strong oxidizing agent in the bile ducts,

binds with bile and dilutes it, increasing the degree of bile secretion through drainage.

Sodium hypochlorite was prepared on an EDO-4 apparatus. A STEL-MT-1 apparatus was used to prepare the anolyte and catholyte solutions.

In case of endobiliary sanitation of the bile ducts with 0.06% sodium hypochlorite solution with the same indicators of bile secretion on the 1st day by the 3rd day, they amounted to  $200 \pm 4.7$  ml / day (in the comparison group  $121 \pm 3.4$  ml per day), to 6th day  $420 \pm 7.1$  ml/day (in comparison group  $280 \pm 6.5$  ml/day).

The obtained results on the study of bile viscosity showed that in the main group, by  $2 \pm 0.3$  days from the start of sodium hypochlorite administration, the bile viscosity indicators normalized and averaged 0.5-0.6 c.u., while in the control group the indicators bile viscosity returned to normal on  $5 \pm 0.4$  days.

Getting into the intrahepatic ducts and diluting bile anolyte sodium hypochlorite solution contributed to the sanitation of the bile ducts by reducing high titers of microbial bodies. As our studies have shown, it is the "acidic" solutions (anolytes) of sodium hypochlorite that have a pronounced disinfectant property and antimicrobial activity. At the same time, the introduction of 400.0 ml of 0.06% anolyte solution of sodium hypochlorite reduced the titer of microbes in the bile inoculation, and it steadily decreased in the following days after administration.

Microbiological examination of bile was carried out on days 1-3-5 and before removal of the drainage. At the same time, *E. coli* was most often determined. *E. coli* - 75.2%, *Klebsiella* - 12.3%, *Enterobacter* - 8.1% and various associations. On the 5th day after intrabiliary sanitation, negative bile cultures were observed in 72% of patients; on the 12th day, complete eradication of the microbial landscape.

The most formidable complications in the control study group of patients were cholangiogenic liver abscesses and biliary sepsis, which caused deaths in 4 patients. Continuing peritonitis in another 1 observation also led to an unfavorable outcome. In total, 5 out of 61 operated patients died in the comparison group, mortality was 8.2%.

At the same time, in the main group, 2 out of 83 operated patients died, mortality was 2.4%. The reason for the poor outcome was acute pancreatitis as a complication of transduodenal endoscopic intervention in 1 patient and ongoing peritonitis in 1 observation.

Various cholemic and purulent-septic complications were observed in 15 patients of the comparison group, which amounted to 24.6%. At the same time, bilomas formed in the subhepatic region in 2 (3.2%), which were drained by recanalization. counterapperture. 5 (11.4%) patients had bile leakage from drainage tubes installed in the subhepatic space, 5 (8.2%) patients underwent repeated operations to open and drain subhepatic or subphrenic abscesses. Also, 2 (3.2%) patients were re-operated for cholemic intra-abdominal bleeding. In 12 (19.6%) patients, suppuration of the postoperative wound was observed.

In the main study group, postoperative complications developed in 10 patients, which amounted to 12.1%. At the same time, bilomas subhepatic region formed in 3 (3.6%) patients who were successfully sanitized by ultrasound-guided punctures. In 2 (2.4%) patients there was cholemic bleeding from the liver from the area of transhepatic puncture of the gallbladder. External bile leakage was observed in 2 patients, during relaparoscopy, in 1 case, a failure of the cystic duct stump was detected, which was repeatedly clipped, in another 1 observation, the gallbladder bed was coagulated as a source of bile leakage into the abdominal cavity. Duodenal bleeding was noted in 1 patient after EPST, the bleeding was stopped. In 1 the patient formed subdiaphragmatic abscess sanitized by repeated punctures under ultrasound control. In 3 patients, suppuration of the postoperative wound was observed.

Thus, the optimization of the tactical and technical aspects of the complex surgical treatment of CAH as a complication of cholelithiasis using minimally invasive decompression interventions and the introduction of sanitation of the biliary tract contributed to the early relief of cholangitis, the prevention of the formation of a liver abscess and the development of biliary sepsis. Achieved a decrease in purulent - septic complications from 24.5% to 12.1%, mortality from 8.2% to 2.4%.

## 5. Findings

1. Factor analysis in acute purulent cholangitis showed that the main cause of mortality are cholangiogenic liver abscesses and biliary sepsis. The highest percentage of deaths (14.8%) and purulent-septic complications (44.4%) were observed after emergency operations with a combination of acute purulent cholangitis with acute destructive cholecystitis and peritonitis.
2. Staged surgical treatment, considering the severity of acute purulent cholangitis and the use of preliminary decompressive interventions on the bile ducts, made it possible to stop the phenomena of cholestasis and purulent intoxication, improving the results of radical operations. At the same time, 81.8% of patients with severe, 61.6% of moderate severity and 24.1% with mild severity of acute purulent cholangitis needed to use diapaetic and endoscopic transduodenal interventions.
3. Transdrainage sanitation of the biliary tract with 0.06% anolyte and catholyte solutions of sodium hypochlorite promotes early eradication of bile microbial contamination, normalization of bilirubin, AsAT and alkaline phosphatase activity, increases bile secretion by more than 2 times.
4. Optimization of the tactical and technical aspects of the complex surgical treatment of acute purulent cholangitis as a complication of cholelithiasis contributed to the improvement of treatment results

due to early relief of cholangitis, prevention of liver abscesses and the development of biliary sepsis. At the same time, a decrease in postoperative purulent-septic and cholemic complications was achieved from 24.5% to 12.1%, mortality from 8.2% to 2.4%.

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