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Multidisciplinary Approach to the Treatment of Acute Calculous Cholecystitis in the Post-Covid Period: Reasons for Changing Tactics and the Scope of Surgical Procedures Performed

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Annotation: Introduction. During the COVID-19 pandemic, the delivery of emergency and elective surgical procedures has been fundamentally changed. Everyone knows that conservative treatment, percutaneous drainage of the gallbladder and cholecystectomy are widely used to treat patients with acute calculous cholecystitis. However, the question of the most effective tactics for treating acute cholecystitis in the early post-Covid period remains poorly understood. It follows that, at this time, it is important to analyze the data on the use of percutaneous and transhepatic drainage of the gallbladder, determine the optimal time for cholecystectomy in acute calculous cholecystitis and compare the effectiveness of "early" and "delayed" cholecystectomy.

The purpose of the work improve the treatment algorithm, develop a new tactical approach and evaluate the results of treatment of patients with acute calculous cholecystitis in the early post-Covid period

Methods. The study included 659 patients aged 20 to 75 years with acute calculous cholecystitis who received treatment at the TMA multidisciplinary clinic in 2020. Patients were divided into two groups: main (391 patients) and control (268 patients). For patients in the control group, a standard treatment regimen for acute cholecystitis was used, while in the main group an improved technique was used, taking into account the shortcomings of the traditional approach. All patients were negative for IgM and positive for IgG. In the main group, all patients underwent routine multislice computed tomography of the chest (MSCT).

Results. All patients initially received conservative therapy; if conservative therapy was ineffective, 39 (75%) patients from the control group were operated on; percutaneous interventions were performed in 23 (42.6%) from the main group. There was no death in the main group.

Discussion. The choice of percutaneous interventions for acute calculous cholecystitis when conservative therapy is ineffective seems appropriate in most patients with post-Covid syndrome.

Conclusion. Performing PPCC in patients with severe condition in the early post-Covid period led to a reduction in the incidence of complications and deaths. The approaches outlined in the results of the work can be used as a safe method in the category of patients under discussion.

Keywords: Acute calculous cholecystitis, COVID-19, early post-COVID period, pneumonia, cholecystectomy, percutaneous cholecystostomy.

Introduction

In December 2019, a new infectious disease, COVID-19, broke out and quickly spread across the world. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic [1]. In this regard, there were significant changes in approaches to the treatment of emergency surgical conditions, in addition to the suspension or postponement of planned procedures. There was a significant decrease in emergency department visits for non-COVID-19-related diseases, as well as a reduction in the volume of medical research conducted. Despite this, unofficial data suggested that the number of patients with acute calculous cholecystitis (ACC) seemed to have increased.

The prevalence of gallstones among the population is 10-15%, and 20-40% of these patients may develop complications associated with gallstones. ACC is the first clinical manifestation in 10-15% of patients with complications of gallstone disease (GSD) [2]. The most commonly used guidelines for the treatment of ACC are the Tokyo Guidelines (TG), first published in 2013 and updated in 2018, and the guidelines of the World Society of Emergency Surgery (WSES) [3-5]. During the pandemic, healthcare systems were forced to adapt to new conditions, given that COVID-19 has a systemic impact on the body, affecting various organs and systems, including the liver and biliary tract. An increase in inflammatory markers, coagulation disorders, and changes in immune status may influence the development and course of acute inflammatory diseases. Furthermore, patients who have recovered from COVID-19 may be at an increased risk of developing complications, requiring a special approach to their treatment and rehabilitation. Organizations such as the British Intercollegiate General Surgery Guidance (BIGSG), the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), and the European Association for Endoscopic Surgery (EAES) recommended a more conservative approach, including antibiotic therapy, percutaneous drainage (PCD), and "watchful waiting" in acute cholecystitis when possible. However, the World Society of Emergency Surgery (WSES) strongly recommended that laparoscopic cholecystectomy remain the standard treatment even in the context of the COVID-19 pandemic and cautioned against the overuse of PCD [6-9]. Scientific data from China showed that even asymptomatic COVID-19-positive patients who underwent surgery had more unfavorable clinical outcomes, including pulmonary complications and increased mortality [10-11]. As a result, during the pandemic, an important question arises about the need to change surgical tactics in the treatment of acute cholecystitis. Currently, there is no systematic review that has thoroughly investigated these aspects.

The purpose of this study is to assess the impact of COVID-19 on the management and treatment of patients with acute calculous cholecystitis and to examine the shift towards a more conservative approach in the treatment of this category of patients during the COVID-19 era.

Materials and Methods.

In 2020, 659 patients with a diagnosis of "Acute calculous cholecystitis" (K80-K81 according to ICD-10) who had a concurrent diagnosis of previously recovered COVID-19 (ICD-10 codes U07.1 and U07.2) were hospitalized in the emergency surgery department of the 2nd clinic of TMA. In all cases, the diagnosis was confirmed according to the diagnostic criteria for acute calculous cholecystitis according to the Tokyo Guidelines (2018). The diagnosis of previous COVID-19 was established by serological method (by the presence of antibodies) - negative results for IgM and positive results for IgG. All patients underwent planned MSCT of the chest. A total of 659 patients with confirmed acute cholecystitis were included in the retrospective study: the 1st control group consisted of 268 patients, the 2nd main group consisted of 391 patients who had recovered from COVID-19. In the 1st group, there was 1 death (from thromboembolic complications), while in the 2nd group, there were no deaths. The age range of all patients was on average from 20 to 75 years. In both groups, women predominated, with a uniform gender distribution in the study groups. The distribution of patients depending on the severity of acute cholecystitis and the severity of recovered COVID-19 is presented in Table 1.

Table 1.

Severity of cholecystitis		Control group			Main group		
		Grade I	Grade II	Grade III	Grade I	Grade II	Grade III
Severity of Covid	**Mild**	85	16	2	161	24	4
	Moderate	106	15	4	101	47	5
	Severe.	21	12	7	33	7	9

For assessing the somatic severity of patients who recovered from COVID-19, in addition to the coronavirus lung damage, a retrospective analysis was used, taking into account a number of indicators. Table 2.

Table 2. **Retrospective assessment of somatic severity of patients who have had Covid 19**

Indicators	1 score	2 score	3 score
PTI (№ 80-110)	<110	111-149	150<
INR (№ 0,85-1,2)	>0,8	0,4-0,8	<0,3
APTT (21-36)	21≤	15-20,9	<14,9
D-dimer (0-500 ng/ml)	≤500	501-800	800<
BCT (Start) sek	≥180	121-179	≤120
BCT (between the starting and the end) sek	≥30	16-29	<15
Length of anamnesis Covid 19	>6	4-6	<4
Maximum volume of lung damage in Covid 19 disease	<20%	21-40%	41-60%
The extent of the damage at the moment	<10%	11-20%	21-30%
SpO_2	>95%	95-92%	<92%
Vital capacity of the lungs	3001-3500	2501-3000	<2500
Tidal volume	401-500	301-400	<300
Inspiratory reserve volume	1251-1500	1000-1250	≤999

Score:

- **Mild 13-21**
- **Moderate 22-30**
- **Severe 31-39**

When analyzing the parameters, the Student's t-test was used. A statistically significant value was considered at $p < 0.05$.

Results

For us, a necessary criterion in choosing a treatment strategy for acute calculous cholecystitis was the determination of the severity of the disease according to the criteria of the Tokyo Guidelines (2018) and the assessment of the somatic severity of patients who recovered from COVID-19. The distribution of patients by severity of the disease in both groups was homogeneous; no statistically significant differences were identified. In the 1st group, 52 (19.4%) patients were operated on (PTC, LCE, OCE), in the 2nd group - 54 (13.8%) ($p \leq 0.05$). The distribution of operated patients depending on the severity of acute cholecystitis and the severity of COVID-19 is presented in Table 3.

Table No. 3. **Distribution of operated patients depending on the severity of acute cholecystitis and the severity of COVID-19.**

Severity of cholecystitis		Grade I	Grade II	Grade III	total	Grade I	Grade II	Grade III	total
Severity of Covid -19	**Mild**	4 (1,5%)	4 (1,5%)	2 (0,7%)	10 (3,7%)	0 (0,0%)	10 (2,6%)	4 (1%)	14 (3,6%)
	Moderate	13 (4,9%)	5 (1,9%)	4 (1,5%)	22 (8,2%)	7 (1,8%)	5 (1,3%)	5 (1,3%)	17 (4,3%)
	Severe	5 (1,9%)	8 (3,0%)	7 (2,6%)	20 (7,5%)	12 (3,1%)	2 (0,5%)	9 (2,3%)	23 (5,9%)
	total	22 (8,2%)	17 (6,3%)	13 (4,9%)	**52 (19,4%)**	19 (4,9%)	17 (4,3%)	18 (4,6%)	**54 (13,8%)**

Multidisciplinary approach to the treatment of acute cholecystitis includes three alternative therapy methods. The first method is conservative therapy, the second is surgical intervention (cholecystectomy, CCE), and the third is percutaneous gallbladder drainage (PGBD). In case of the inefficacy of conservative therapy, either surgical intervention or PGBD can be considered, depending on specific circumstances (timing, severity of acute cholecystitis, the overall condition of the patient, or comorbidity index).

It should be noted that our main strategy in the treatment of acute calculous cholecystitis in the main group was the choice of "delayed" cholecystectomy, taking into account the severity of the patient's condition (cholecystitis and post-COVID condition) and the use of conservative therapy; if ineffective, followed by an active strategy in the form of the installation of PTC. Percutaneous interventions, such as puncture and drainage of the gallbladder under X-ray control, were performed in 13 (25%) patients in the 1st group and 23 (42.6%) in the 2nd group.

Postoperative complications (wound complication, postoperative pneumonia, pleurisy, PE, MI, catheter displacement) were noted in 13 (25%) and 1 fatal outcome (1.9%) in the control group, and in the main group, complications occurred in only 8 (14.8%) patients without lethality.

Discussion

The analysis, as a result of which the above data was obtained, showed that the study has a number of limitations requiring further clarification— the choice of tactics for patients with respiratory failure syndrome and the state of the blood coagulation system, which was not reflected in this work. The group of patients with severe COVID-19 may represent the most vulnerable category. Consequently, coagulation system indicators and the functional state of the respiratory system are the main determinants of disease severity. It is assumed that surgical intervention in this category of patients can not only cause an immediate violation of immune function but also intensify the systemic inflammatory response. The materials of this study did not reveal aggravating factors when choosing an operative method of treatment— "early" cholecystectomy for acute cholecystitis in patients with COVID-19 in the absence of contraindications, a stable condition, and only initial changes in the lungs, provided the prevention of thromboembolic complications.

Conclusions

The results of this study indicate that the proposed approaches can be used as a safe method of treatment in the considered category of patients, as they lead to a reduction in the frequency of postoperative complications. For patients at high risk, percutaneous gallbladder drainage may serve as an effective alternative to cholecystectomy in cases where conservative therapy proves to be insufficiently effective.

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